INTERNATIONAL ABSTRACT OF SURGERY

VOLUME 78 MAY, 1944 NUMBER 5

THE SULFONAMIDES AS THERAPEUTIC AGENTS IN INTESTINAL ANTISEPSIS

Collective Review

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RECENT studies conducted on various sulfonamides as possible chemotherapeutic agents for intestinal antisepsis are another step along the long path of this subject. Much effort has been expended in the hope of finding some relatively innocuous substance which would alter significantly the bacterial flora of the gastrointestinal tract without adversely affecting the host. The feeling among many investigators that arthritis is caused by the absorption of toxic substances from the gastrointestinal tract has served well to keep interest alive in this field. A tremendous amount of work has been done on the use of various diets as well as of drugs in an attempt to effect such an alteration in the alimentary tract. Regardless of whether one uses an ordinary diet or substances which we classify as drugs, any material which will alter the thermodynamic environment in such a manner as to give a medium unsuited to the multiplication of bacteria will result in a profound change in the bacterial flora.

Escherich (32) carried out the first systematic study of intestinal flora. He observed a preponderance of gram-negative rods in the stools of healthy nursing infants. The classical research of Tissier (95) and Moro (64) showed that the acidophilic flora was comprised primarily of lactobacillus acidophilus. Mannaberg (56) credits Billroth (18) with having first observed that the meconium of the new-born infant is sterile. Shortly after birth, the meconium is infected by organisms entering the body through both the mouth and the anus, but the establishment of the characteristic flora of the infant is dependent upon the type of food ingested. The breast-fed infant appears to establish lactobacillus bifidus as the predominating organism in the gastrointestinal tract. Should the infant be changed over to bottle feeding with cow's milk, the intestinal flora will become less homogeneous, but there will be a large proportionate increase of lactobacillus acidophilus. As the child becomes older and a more varied diet is taken, the bacterial flora becomes more complex and in time assumes the characteristics of that found in the adult (Logan, 53; Fischer, 36; Sittler, 91). Escherich demonstrated that the sterilization of food had little or no influence on the number or character of organisms in the gastrointestinal tract. The question of whether or not an intestinal flora is necessary for the well-being of the host was first asked by Pasteur. In the meantime, a great deal of research has been done in an attempt to answer this question, and at the present time considerable interest has been aroused in connection with deficiencies occurring in animals put on highly purified diets and fed phthalylsulfathiazole, succinylsulfathiazole, and sulfanilylguanidine, and in connection with the action of "folic acid" and biotin.

The bulk of the stool made up by organisms has been variously estimated. MacNeal, Latzer, and Kerr (55) estimated that 3.3×10^{13} bacteria are excreted daily. This number of bacteria would be equivalent to approximately 5.4 gm. of dried bacteria. Mattill and Hawk (60) and Sato (89) placed the quantity at a somewhat higher level, between 8.3 and 8.6 gm. per day.

Bouchard (13) may well be regarded as the pioneer in the study of intestinal antisepsis. He administered charcoal, naphthalene, and iodoform, and studied their effect on the stools and

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urine. Griffith (37) and Williams (103) claimed to have observed the beneficent effect of the administration of chlorine to patients with typhoid fever. In 1906, Hoffman demonstrated that the oral administration of iodoform effectively reduced the number of bacteria in the feces. Herter (41) observed that occasionally the salicylates, aspirin and salol, decreased the output of indican, but he reached the conclusion that so-called intestinal antiseptics do not materially reduce the putrefactive organisms in the intestine. Hand (39) reports salicylate as an intestinal antiseptic in acute diarrhea. By and large, however, the early use of substances as intestinal antiseptics has proved rather disappointing.

DIET AND BACTERIAL IMPLANTATION

In view of the fact that the bacterial flora is so profoundly altered by diet, it might seem surprising that so little attention has been given this phase of intestinal antisepsis. A high carbohydrate diet generally effects a decrease in the proteolytic bacterial flora as first observed by Herter and Kendall in 1909. When Torrey (1915) added lactose to a diet containing a predominence of other carbohydrates, it was found that the bacterial flora of the bowel became less complex and was composed principally of lactobacillus acidophilus in an acidophilic flora. Bass (1923) demonstrated lactose to be an especially important substance in bringing about this change in the bacterial flora.

While feeding rats a diet consisting of 60 per cent carbohydrate, Mitchell (1927) found that when sucrose, maltose, lactose, dextrine, and starch were fed the increase in the acidophilic flora paralleled the sugar content of the feces and the carbohydrate content of the feces was greatest when lactose was the carbohydrate employed.

Many attempts have been made to alter the bacterial flora of the bowel by implantation of various strains of micro-organisms into the gastrointestinal tract for the purpose of transforming the flora by the antagonism of a predominating organism. Poehl (67) demonstrated a decrease in intestinal putrefaction when sour milk was fed. Tissier and Martelly (97) observed that the lactic acid produced by the lactic-acid bacilli was the chief agent effecting inhibition of putrefying organisms. Confirming the conclusions of Bienstock (7), Tissier and Gasching (96) found that acid-producing bacilli grown in a sugar-containing medium can arrest the growth of putrefactive organisms.

DeJager (29) and Teixeira de Mattos (94) introduced the administration of buttermilk to infants afflicted with gastrointestinal disturbances. This practice became quite popular and many favorable results from its use were reported. In Holland, buttermilk has long been a favorite food for infants among the peasantry.

MODE OF ACTION AND TOXICITY OF THE SULFONAMIDES RESTRICTED TO THE ALIMENTARY TRACT

The mode of action of the sulfonamides as bacteriostatic agents must be very closely related to their toxic manifestations. The difference is that in the one instance these effects are reflected by the metabolic activity of the bacteria, while in the other they are expressed by abnormal reactions of the host's cells. Recent studies on nutrition (Black, Overman, Elvehjem, and Link, 10; Martin, 59; Nielsen and Elvehjem, 65; Welch and Wright (102a); Wright and Welch (105a) have extended the observations on the original simple concept of the role played by p-aminobenzoic acid (Woods, 105) in inhibiting the action of the sulfonamides. Basically, the action of the sulfonamides is probably fundamental and probably involves various enzyme systems and chains in mechanisms not as yet understood. When young rats were fed diets highly purified to exclude "folic acid" and biotin, the animals grew normally although there was a pronounced reduction in the "folic acid" and biotin stored in the liver. If, however, 2 per cent of succinylsulfathiazole was incorporated in the diet, the animals failed to grow and died after several weeks. The pantothenic-acid content of the liver was strikingly decreased, and the deficiency could not be corrected by the administration of additional quantities of pantothenic acid, either oral or parenteral. The administration of crystalline biotin and "folic-acid" concentrates promptly corrected the deficiency, as well as the achromotrichia and the porphyrin-caked whiskers, and restored the pantothenic-acid content of the liver.

Agranulocytosis is one of the most serious of the toxic manifestations following the administration of sulfonamides. Agranulocytosis has been produced in growing rats with purified diets containing 1 per cent of either succinylsulfathiazole or sulfanilylguanidine (Spicer, Daft, Sebrell, and Ashburn, 91a), and may be prevented or cured with whole dried liver. Undoubtedly, crystalline biotin or "folic-acid" concentrates would show similar prophylactic and curative properties. In a similar manner Daft, Ashburn, Spicer, and Sebrell (28a) produced hyaline sclerosis and calcification of blood vessels and a dermatitis (Daft, Ashburn, and Sebrell, 28) in rats. Is the solution of the mode of action of the

sulfonamides to come from these and similar fundamental studies?

The concentration of the poorly absorbed sulfonamides in the alimentary tract is and must be extraordinarily high in order to effect bacteriostatic action in a rich and heavily inoculated culture medium such as is available in the gastrointestinal tract for the support of bacterial growth. It is highly probable that the intrinsic chemical and physical properties of compounds such as succinylsulfathiazole and phthalylsulfathiazole, which influence their absorption and adsorption by specific bacterial cells with alteration of the normal metabolic activity of the organisms, are operative in the resulting bacteriostasis. The simplest concept, of course, is to assume that the entire action of the acylated, dibasic sulfonamide derivatives is due to the concentration of sulfathiazole maintained locally in the bowel and resulting from hydrolysis. Numerous observations (made by myself) on the hydrolysis rates of the various compounds used in this series of experiments do not, however, always support this simple view.

THE LOCAL ANTIBACTERIAL ACTION OF THE SULFONAMIDES IN THE BOWEL

As would be expected, those sulfonamides which are poorly absorbed from the gastrointestinal tract show the greater antibacterial action localized to the bowel. Sulfanilamide is rapidly absorbed from the bowel and possesses no local antibacterial activity. Sulfathiazole, sulfapyridine, and sulfadiazine, which are more slowly absorbed and therefore maintain a moderate local concentration of the drug, have varying antibacterial activity in the gastrointestinal tract.

A higher degree of local antibacterial activity is shown by certain of the sulfonamides which are poorly absorbed from the bowel even though these compounds possess but slight intrinsic antibacterial activity in vitro. Sulfanilylguanidine, originally synthesized by Roblin and his associates (82) and reported upon by Marshall (57) was the first of these substances described. While this compound was demonstrated to alter the bacterial flora in mice, as indicated by a lowering of the coliform flora in the feces, it was shown by Poth, Knotts, Lee, and Inui (75) in dogs, and by Firor and Poth (35) in human subjects, to possess rather limited local, bacteriostatic properties. Subsequently, Poth and Knotts (73) and Poth, Knotts, Lee, and Inui (75) reported on a considerable series of conjugated sulfonamides, including succinylsulfathiazole, which possessed local, bacteriostatic properties but only slight activity in vitro. Recently, Poth and Ross (76, 77) extended this study to an additional series of eighteen compounds. Of these substances, phthalylsulfathiazole, quinonylsulfathiazole, and malelysulfathiazole possess excellent local bacteriostatic activity. Phthalylsulfathiazole is apparently the most potent of the sulfonamides as regards local antibacterial action in the bowel described to date. Its activity has been studied in the dog and in man by Poth and Ross (76, 77, 78), and in rabbits, mice, rats, and monkeys by Mattis, Benson, and Koelle (60a).

The degree to which the bacterial flora is altered locally by these more potent sulfonamides becomes more evident when compared to changes effected by diet. Diet and implantation of the lactobacillus acidophilus may bring about a conversion to the extent that 90 per cent of the bacteria will be of the implanted strain. However, in absolute numbers, this may mean that other organisms may be present in high concentration. For example, if the total bacterial count is 100,000,000 per gm. of stool, more than 1,000,000 of the bacillus coli per gm. of stool may still be present. A significant alteration of the flora by succinylsulfathiazole or phthalylsulfathiazole will, on the other hand, reduce the coliform organisms from 10,000,000 to 1000, 100, or even 0 bacteria per gm. of stool. In other words, a reduction from 1,000,000 to 10 represents a reduction of the coliform bacteria to 0.0001 of 1.0 per cent of the initial flora.

In conjunction with this change, it has been shown that many other strains of organisms are being reduced in population.

While the effectiveness of these drugs may conveniently be followed by observing the reduction in the coliform bacteria, it is equally or even more important to realize that significant reductions in the total numbers of gram-negative and gram-positive organisms (Poth, 70), and the anaerobic cocci and the clostridia (Lockwood, 52; Poth and Ross, 76) occur following the administration of succinylsulfathiazole and phthalylsulfathiazole. These drugs have little antibacterial action against the typhoid-paratyphoid groups of organisms. Succinylsulfathiazole was administered in 14 cases of typhoid fever. There was no specific action to reduce the typhoid bacilli in the stools, but the usual abdominal distention did not occur and no additional bowel care was required. In 1 instance, perforation of the ileum occurred. At operation, 3 perforations were found, and cultures of the free fluid in the peritoneal cavity were negative for the bacillus coli. The patient made an uneventful recovery.

THE USE OF THE SULFONAMIDES IN THE TREATMENT OF DIARRHEAS

The diarrheas may be divided into two broad groups: those due to specific, known etiological factors, and those in which the cause is either nonspecific or unknown.

Among the latter, we find the highly fatal epidemic diarrheas of the newborn and the frequent outbreaks of diarrhea of older individuals not due to dietary indiscretion.

The specific diarrheas include cholera, amebic and bacillary dysenteries, bacillus coli enteritis of newborn calves, and the staphylococcus enteritis due to contaminated foods.

The use of the sulfonamides in the treatment of the nonspecific diarrheas may or may not be of benefit. Succinylsulfathiazole has been given recently (Twyman and Horton, 98) for the treatment of neonatal diarrhea in a highly fatal epidemic, with a marked reduction in mortality. The treated patients showed a prompt decrease in the number of stools and a normal increase in weight, while the control patients continued with diarrhea and failed to gain weight for approximately three weeks.

Little has been reported on the use of the sulfonamides in the treatment of amebic dysentery. Knotts and Thompson (49) treated 9 patients with proved histolytica infections, using succinylsulfathiazole. Sulfapyridine was used by Chatteyer (18). Since it has not been proved that the sulfonamides possess specific antiprotozoal activity, it is best that the improvement observed be accredited to the alteration of the bacterial flora, and the reduction of the accompanying nonspecific infection to aid in the healing of the accompanying ulcerations in the bowel.

Bacillary dysentery has been treated extensively with the sulfonamides and probably calls for the greatest use of these drugs among the acute enteric infections. The shigella dysenteriae is highly susceptible to the sulfonamides, and excellent results are obtained in the treatment of bacillary dysentery by any active sulfonamide which can be maintained in contact with the organisms in sufficient concentration. Excellent review articles have been written recently by Weil (100) and Neter (64a, 64b) on bacillary dysentery.

Sulfapyridine was probably the first of these drugs used successfully in this condition. The specific results were good, but the untoward toxic reactions were rather frequent and often severe.

Sulfathiazole is particularly useful, but while toxic reactions are less severe and less frequent, they are not rare. Sulfadiazine is considered by Hardy as the most satisfactory of the compounds for the treatment of the acute phase of the disease.

Sulfanilylguanidine has been extensively promoted and used. From the beginning, however, it was noted that this compound was not always effective if administered later than five days after the onset of the disease. The reason for the failures are apparent when one considers the evidence presented by Firor and Poth (35), who showed that sulfanilylguanidine is relatively ineffective as an antibacterial agent when used locally in the bowel in the presence of ulcerating lesions in the gastrointestinal tract.

Succinylsulfathiazole was first used in the treatment of acute bacillary dysentery by Poth, Chenoweth, and Knotts (71). Promising results were obtained. Subsequent reports have substantiated these observations. The most careful, critical, and comparative study on the use of the sulfonamides in the treatment of acute bacillary dysentery, as well as of carriers of the disease, has been done by Hardy and his coworkers. Hardy, Burns, and DeCapito (39a) make the following concluding statement: "These cultural data reveal differences in the bacteriostatic action of the sulfonamides on shigella dysenteriae. Sulfadiazine stood first in rapidity of action and would be judged the most promising for the treatment of clinical infections due to the varieties of shigella encountered in this country. 'Sulfasuxidine' was more effective than sulfaguanidine and was superior to sulfadiazine in convalescent and passive carriers of Sonne." Because of the public health hazard and the possibility that late bacillary dysentery may be a causative factor in chronic ulcerative colitis, these types of infections assume great importance. An observation by Caldwell and Hardwick (17) on the relative effectiveness of sulfanilylguanidine and succinylsulfathiazole in the treatment of a case of chronic bacillary dysentery (Flexner) is significant. After treating this patient with sulfanilylguanidine on four different occasions for a total of fifty days spread over the period of a year, the paradysenteriae organisms continued to be excreted in the feces. After a seven-day course of therapy with succinylsulfathiazole, eighteen months after the onset of the disease, the diarrhea ceased and the feces were consistently negative for the specific organisms.

The most useful drug in the treatment of bacillary dysentery may well be one which is absorbed into the depths of the ulcerations present in the fully developed disease. Poth, Knotts, Lee, and Inui (75) showed that succinylsulfathiazole is rapidly absorbed when implanted subcutaneously and intramuscularly. The author has repeatedly

demonstrated that the topical application of "sulfasuxidine" is effective in rapidly freeing contaminated wounds of coliform organisms. Pulvertaft and Mackenzie (79) recently reported upon the use of succinylsulfathiazole in the topical treatment of wounds. Even though the drug is present in high concentration and may be readily absorbed from a denuded surface, the actual surface of the bowel involved in the ulcerations and devoid of an epithelial covering is relatively small as compared to the area covered by mucosa, with the result that, although the concentration of the drug in contact with the lesions is high, the quantity of drug absorbed remains negligible since the intact mucosa absorbs succinylsulfathiazole sparingly.

An exhaustive study of the bacteriostatic properties and limited clinical observations made on phthalylsulfathiazole, as reported by Poth and Ross (76, 77, 78), give high promise that this drug may prove to be superior so succinylsulfathiazole in the treatment of enteric infections.

ULCERATIVE COLITIS

While chronic ulcerative colitis is not a rare disease, it is not of frequent occurrence. But, because of its chronic nature and great tendency to incapacitate its victim in its frequent and prolonged exacerbations, many of these cases are to be found in all larger clinics, and they present a most troublesome problem in the absence of satisfactory curative treatment. The underlying etiological basis of this symptom complex is often unknown and may well be an expression of multiple factors. In a continuing search for a remedy, the sulfonamides have come under consideration. Practically all of the members of this series of drugs have been tried by various investigators. Some encouraging results have been observed, but, by and large, the indications are that wholly satisfactory therapeutic measures will not be found in these studies. If in a particular instance the alpha streptococcus group of organisms should be the aggravating factor, the administration of a sulfonamide would be contraindicated because these compounds have no antibacterial activity against these organisms and usually permit them to increase their population as the numbers of other organisms are reduced.

Because of the polyvalent nature of this disease entity, or rather symptom complex, which is the expression of numerous factors (including local allergic conditions, nutritional deficiencies, tuberculous ulcerative colitis, ulcerative colitis following amebiasis, a late form of bacillary dysentery, hemolytic bacillus-coli ulcerative colitis, and the lesions presumably due to certain strains of streptococci) no one group of drugs, such as the sulfonamides which possess similar properties, can logically be expected to be effective in all cases. It can be hoped, however, that they will be beneficial in cases of ulcerative colitis following bacillary dysentery and bacillus-coli infection, and as an adjuvant following amebiasis. The author has noticed repeatedly that the administration of the sulfonamides must be continued over a period of weeks and months in full therapeutic doses if any beneficial results are to be obtained. Therefore, even greater selection of cases must be exercised. Only those individuals who tolerate the drugs well can be subjected to this prolonged treatment, and probably only drugs such as succinylsulfathiazole and phthalylsulfathiazole, which are sparingly absorbed from the alimentary tract, will be reasonably tolerated for such long periods. The sulfonamides act best in the acute and active stages, and it is here, likewise, that the highest incidence of drug intolerance is found.

At present, remissions can be initiated and sustained in approximately one-half of unselected cases of ulcerative colitis. Bargen (4, 5) has long been interested in the etiology and treatment of ulcerative colitis, and it is indeed encouraging that he continues to have hope.

Rodaniche, Kirsner, and Palmer (85) treated 12 patients suffering from "nonspecific ulcerative colitis" with sulfathiazole, sulfadiazine, sulfanilylguanidine, and succinylsulfathiazole, and concluded: "The use of these compounds does not alter significantly the clinical course of the disease." And while their best results were obtained when succinylsulfathiazole was administered, they further stated: "The mechanism by which the sulfonamides act in the feces is not defined, but certainly the rate of absorption is not the decisive factor. One may assert, in fact, that except for marked reduction in toxicity, little has been accomplished by the synthesis of new sulfonamide compounds as regards increased range and degree of activity." It would appear rather logical that reduction of the toxicity would increase the range of usefulness of these compounds therapeutically. But, again, as in much that has been written recently on the treatment of ulcerative colitis with the newer sulfonamides, the number of cases involved has been too small to permit significant conclusions. The simple fact remains, however, that a careful comparative study of the treatment of ulcerative colitis (Streicher, 93) shows succinylsulfathiazole to be the most efficacious of the sulfonamides. A limited use of phthalylsulfathiazole by the author

indicates that the latter drug might be expected to be superior to all other members of this series of compounds and deserves further study. Phthalylsulfathiazole has been administered in full therapeutic doses continuously for six months without evidence of untoward toxic reactions.

SULFONAMIDES AS ADJUVANTS IN SURGERY OF THE COLON

The direct implantation of the sulfonamides into the peritoneal cavity to overcome peritonitis following contamination by leakage of the fecal contents has been shown to be a useful procedure but is not a part of this report.

Firor and Jonas (34) used sulfanilylguanidine in the preoperative preparation of 12 patients subjected to surgical procedures on the colon. These patients did well, but the authors did not believe that the series was sufficient to draw any conclusions as to the value of the procedure. Subsequently, Firor and Poth (35) showed that sulfanilylguanidine when administered as recommended in the preceding article had only a minimal bacteriostatic effect and that the compound was entirely lacking in bacteriostatic properties, as indicated by alteration of the coliform flora in the presence of ulcerations in the gastrointestinal tract. When the frequency of dosage was changed from eight-hour to four-hour intervals, following which the drug had a significant degree of antibacterial action if the bowel mucosa was intact, toxic reactions occurred in approximately one-fourth of the subjects and an average of 50 per cent of the ingested drug was recovered from the urine in the absence of diarrhea. This essentially confirms the findings of Marshall, Bratton, White, and Litchfield (57) who found that a dog given a single dose of 0.01 gm. per kilogram of sulfanilylguanidine excreted 74 per cent of the ingested drug in the urine within twenty-four hours, and the findings of Marshall, Bratton, Edwards, and Walker (58), who reported that 2 patients suffering with bacillary diarrhea excreted 16 and 35 per cent of the ingested drug, respectively. Kidney stones consisting of crystalline sulfanilylguanidine are produced routinely when dogs are administered large doses of the drug for a period of from three to five weeks.

The therapeutic use of succinylsulfathiazole was introduced by Poth and Knotts (74); it was based upon the experimental studies of Poth, Knotts, Lee, and Inui (75) and Welch, Mattis, and Latven (102).

When 0.04 gm. of succinylsulfathiazole per kilogram of body weight is administered orally every four hours to patients on a low residue diet, the consistency of the stools is rendered semifluid, practically odorless, and of small bulk. The coliform flora is significantly altered and frequently reduced to zero in from three to seven days. Lockwood (52) demonstrated that the clostridia were similarily reduced to significantly small numbers. Without the administration of purgatives, it is found that in the absence of obstruction the bowel will be empty and in excellent condition for an operation. While it appears likely that this drug is of value in the preoperative preparation of the colon and the postoperative treatment of the patient to protect the individual in the event of leakage at the suture line, the authors properly emphasize that the smooth, uncomplicated postoperative convalescence of these patients appears significant and the administration of the drug may well prove to become a valuable adjuvant in surgical procedures on the colon. However, it must not be substituted in the slightest degree for the established principles of colon surgery which have contributed so greatly to the recent production of increasingly better results. The importance of the alteration and simplification of the bacterial flora of the alimentary tract is emphasized by the studies of Meleney, Olpp, Harvey, and Zaytseff-Jern (62), who showed that following intraperitoneal inoculation, mixtures of bacillus coli, clostridium welchii, and alpha streptococcus were from ten to fifteen times as lethal as pure cultures of these organisms.

Enough time has not elapsed to evaluate fully the results of altering the bacterial flora during the immediate preoperative and postoperative periods, and only a few publications have appeared to report upon further observations on the procedure, although the regime is being rather widely used. Allen (1) remarked upon the unusually smooth convalescence following combined abdominoperineal resection after the use of succinylsulfathiazole.

There is some indication that bleeding from ulcerations in the bowel may be more frequent when succinylsulfathiazole is administered (Firor, 33a; Allen, 1).

Fortunately, toxic reactions are infrequent, but it must be emphasized that these reactions will occur in the patient who is highly sensitive to sulfathiazole. None of the sulfonamides can be regarded as innocuous, and succinylsulfathiazole is no exception even though an average of less than 5 per cent of the ingested drug is excreted in the urine and the concentration of the drug in the blood seldom exceeds 2.5 mgm. per 100 cc.

Succinylsulfathiazole is a useful adjuvant in surgery of the colon and should be used as follows:

1. Preoperative preparation of the alimentary tract to render the bowel empty and alter the bacterial flora.

2. Local implantation of from 2 to 4 gm. of sulfathiazole suspended in physiologically normal salt solution in the region of the intestinal anastomosis (Poth and Fernandez, 72).

3. Gastric suction for twenty-four to forty-eight hours immediately following the operation.

4. Oral administration of succinylsulfathiazole in full therapeutic doses as soon as gastric suction is interrupted, which is to be continued for twelve days.

5. Administration of sulfathiazole or sulfadiazine for its general tissue and systemic effect when gross soiling has occurred. Whenever severe diarrhea is present, it must be checked by appropriate measures.

CONCLUSIONS

The sulfonamides which are sparingly absorbed from the alimentary tract are most effective in altering the bacterial flora. Profound changes of the intestinal flora can be effected without the occurrence of frequent toxic reactions.

Many of these drugs are highly effective in the treatment of both acute and chronic infections by the shigella paradysenteriae and readily free the carriers of the specific organisms. In addition, they may act as adjuvants in the treatment of amebic infections.

The use of the sulfonamides in the treatment of chronic ulcerative colitis is on the whole disappointing. It may be of value in a limited percentage of cases to prolong remissions and as an adjuvant in the treatment of this group of maladies. It is indicated in the preparation of the large bowel prior to the extensive resection of the colon, which is proving to be the most satisfactory treatment of ulcerative colitis that produces irreversible local anatomical changes.

Locally, it can be expected that the alteration and simplification of the bacterial flora of the gastrointestinal tract should prove a valuable adjuvant in surgery of the colon to protect the patient against fatal peritonitis. In conjunction with those drugs which are more readily absorbed from the alimentary tract, and which are given for their usefulness in impregnating the general body tissues with a sulfonamide as well as for local implantation, succinylsulfathiazole, phthalylsulfathiazole, and similar compounds may be anticipated to become real surgical adjuvants. The use of these drugs to alter the bacterial flora is contributing greatly in various fundamental studies in the field of nutrition.

The subject of intestinal antisepsis is still in its infancy, and it may be hoped that real advances can be anticipated.

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indicates that the latter drug might be expected to be superior to all other members of this series of compounds and deserves further study. Phthalylsulfathiazole has been administered in full therapeutic doses continuously for six months without evidence of untoward toxic reactions.

SULFONAMIDES AS ADJUVANTS IN SURGERY OF THE COLON

The direct implantation of the sulfonamides into the peritoneal cavity to overcome peritonitis following contamination by leakage of the fecal contents has been shown to be a useful procedure but is not a part of this report.

Firor and Jonas (34) used sulfanilylguanidine in the preoperative preparation of 12 patients subjected to surgical procedures on the colon. These patients did well, but the authors did not believe that the series was sufficient to draw any conclusions as to the value of the procedure. Subsequently, Firor and Poth (35) showed that sulfanilylguanidine when administered as recommended in the preceding article had only a minimal bacteriostatic effect and that the compound was entirely lacking in bacteriostatic properties, as indicated by alteration of the coliform flora in the presence of ulcerations in the gastrointestinal tract. When the frequency of dosage was changed from eight-hour to four-hour intervals, following which the drug had a significant degree of antibacterial action if the bowel mucosa was intact, toxic reactions occurred in approximately one-fourth of the subjects and an average of 50 per cent of the ingested drug was recovered from the urine in the absence of diarrhea. This essentially confirms the findings of Marshall, Bratton, White, and Litchfield (57) who found that a dog given a single dose of 0.01 gm. per kilogram of sulfanilylguanidine excreted 74 per cent of the ingested drug in the urine within twenty-four hours, and the findings of Marshall, Bratton, Edwards, and Walker (58), who reported that 2 patients suffering with bacillary diarrhea excreted 16 and 35 per cent of the ingested drug, respectively. Kidney stones consisting of crystalline sulfanilylguanidine are produced routinely when dogs are administered large doses of the drug for a period of from three to five weeks.

The therapeutic use of succinylsulfathiazole was introduced by Poth and Knotts (74); it was based upon the experimental studies of Poth, Knotts, Lee, and Inui (75) and Welch, Mattis, and Latven (102).

When 0.04 gm. of succinylsulfathiazole per kilogram of body weight is administered orally every four hours to patients on a low residue diet, the consistency of the stools is rendered semifluid, practically odorless, and of small bulk. The coliform flora is significantly altered and frequently reduced to zero in from three to seven days. Lockwood (52) demonstrated that the clostridia were similarily reduced to significantly small numbers. Without the administration of purgatives, it is found that in the absence of obstruction the bowel will be empty and in excellent condition for an operation. While it appears likely that this drug is of value in the preoperative preparation of the colon and the postoperative treatment of the patient to protect the individual in the event of leakage at the suture line, the authors properly emphasize that the smooth, uncomplicated postoperative convalescence of these patients appears significant and the administration of the drug may well prove to become a valuable adjuvant in surgical procedures on the colon. However, it must not be substituted in the slightest degree for the established principles of colon surgery which have contributed so greatly to the recent production of increasingly better results. The importance of the alteration and simplification of the bacterial flora of the alimentary tract is emphasized by the studies of Meleney, Olpp, Harvey, and Zaytseff-Jern (62), who showed that following intraperitoneal inoculation, mixtures of bacillus coli, clostridium welchii, and alpha streptococcus were from ten to fifteen times as lethal as pure cultures of these organisms.

Enough time has not elapsed to evaluate fully the results of altering the bacterial flora during the immediate preoperative and postoperative periods, and only a few publications have appeared to report upon further observations on the procedure, although the regime is being rather widely used. Allen (1) remarked upon the unusually smooth convalescence following combined abdominoperineal resection after the use of succinylsulfathiazole.

There is some indication that bleeding from ulcerations in the bowel may be more frequent when succinylsulfathiazole is administered (Firor, 33a; Allen, 1).

Fortunately, toxic reactions are infrequent, but it must be emphasized that these reactions will occur in the patient who is highly sensitive to sulfathiazole. None of the sulfonamides can be regarded as innocuous, and succinylsulfathiazole is no exception even though an average of less than 5 per cent of the ingested drug is excreted in the urine and the concentration of the drug in the blood seldom exceeds 2.5 mgm. per 100 cc.

Succinylsulfathiazole is a useful adjuvant in surgery of the colon and should be used as follows:

1. Preoperative preparation of the alimentary tract to render the bowel empty and alter the bacterial flora.

2. Local implantation of from 2 to 4 gm. of sulfathiazole suspended in physiologically normal salt solution in the region of the intestinal anastomosis (Poth and Fernandez, 72).

3. Gastric suction for twenty-four to forty-eight hours immediately following the operation.

4. Oral administration of succinylsulfathiazole in full therapeutic doses as soon as gastric suction is interrupted, which is to be continued for twelve days.

5. Administration of sulfathiazole or sulfadiazine for its general tissue and systemic effect when gross soiling has occurred. Whenever severe diarrhea is present, it must be checked by appropriate measures.

CONCLUSIONS

The sulfonamides which are sparingly absorbed from the alimentary tract are most effective in altering the bacterial flora. Profound changes of the intestinal flora can be effected without the occurrence of frequent toxic reactions.

Many of these drugs are highly effective in the treatment of both acute and chronic infections by the shigella paradysenteriae and readily free the carriers of the specific organisms. In addition, they may act as adjuvants in the treatment of amebic infections.

The use of the sulfonamides in the treatment of chronic ulcerative colitis is on the whole disappointing. It may be of value in a limited percentage of cases to prolong remissions and as an adjuvant in the treatment of this group of maladies. It is indicated in the preparation of the large bowel prior to the extensive resection of the colon, which is proving to be the most satisfactory treatment of ulcerative colitis that produces irreversible local anatomical changes.

Locally, it can be expected that the alteration and simplification of the bacterial flora of the gastrointestinal tract should prove a valuable adjuvant in surgery of the colon to protect the patient against fatal peritonitis. In conjunction with those drugs which are more readily absorbed from the alimentary tract, and which are given for their usefulness in impregnating the general body tissues with a sulfonamide as well as for local implantation, succinylsulfathiazole, phthalylsulfathiazole, and similar compounds may be anticipated to become real surgical adjuvants. The use of these drugs to alter the bacterial flora is contributing greatly in various fundamental studies in the field of nutrition.

The subject of intestinal antisepsis is still in its infancy, and it may be hoped that real advances can be anticipated.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Gurdjian, E. S., Webster, J. E., and Brown, J. C.: Impression Technique for Reconstruction of Large Skull Defects. *Surgery*, 1943, 14: 876.

The need occasionally arises for the reconstruction of unusually large and asymmetrical defects of the skull. When an inanimate transplant is used, it may be prepared to fit the defect accurately prior to operative repair.

The authors describe a method for the repair of large skull defects with plexiglass (methylmethacrylate). J. M. MORA, M.D.

Fig. 1. To the left is shown a model of the skull with the defect to be repaired. To the right is shown a positive and negative of the area of defect after build-up. The plexiglass graft is held in the right hand.

Fig. 2. To the left is shown the plaster model of the skull with the defect eliminated by the use of the plexiglass graft. To the right is shown the positive and negative of the area of defect after build-up.

EYE

Lyle, D. J.: Eye Manifestations of Head Injuries. *J. Am. M. Ass.*, 1943, 123: 873.

The three principal classes of head injuries with ocular manifestations, namely, automobile and travel accidents, industrial accidents, and direct war injuries, present no noticeable difference in their end-results. The chief concern is not the amount of damage to the skull, but the extent of damage to the brain. These injuries may be classified as concussion, contusion, laceration, and compression. Injuries to the eyeball may be similarly classified.

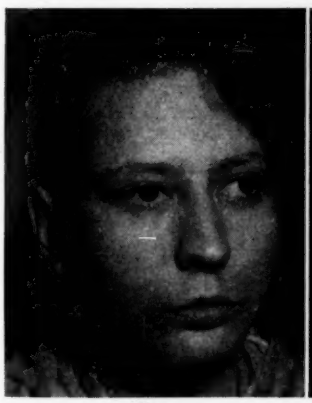


Fig. 3

Fig. 4

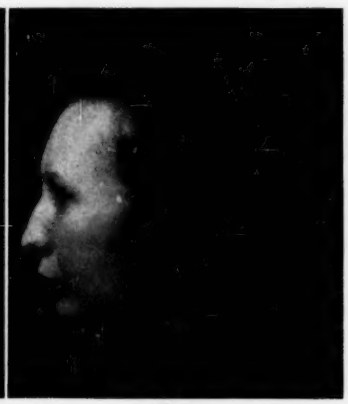


Fig. 5

Fig. 3. Appearance of patient prior to repair of postoperative skull defect after removal of a large frontal meningioma. Figs. 4 and 5. Anteroposterior and lateral view of patient one year after repair.

In concussion the pupils are usually constricted and fixed. The retina may become ischemic with later engorgement of the veins and edema (commotio retinae). This may be accompanied by hemorrhage between the chorioid and sclera, and by slight edema of the papilla. Localized edema of the retina may occur (angiopathic traumatic edema of the retina of Purtscher). The state of shock, with rapid pulse, shallow respiration, low temperature, cold, clammy, pale skin, and muscular relaxation, is of major importance after a concussion injury.

Contusion is a bruising of the brain, usually as a result of its sudden impact against the skull wall, and this may occur either at the site of the impact or on the opposite side (contrecoup). The areas most frequently involved are the temporal poles and the under side of the frontal lobes where edema and petechial hemorrhages may result in damage to the nerves and blood vessels of the eyes. Injuries to the orbital tissue and bony walls of the orbit may cause edema, hemorrhages, and exudates in the eyeball itself as a result of contusion.

Laceration of the brain may occur with a severe closed injury or with penetrating wounds. In the eye, laceration may be due either to a rupture of one of the coats, or to penetration by foreign bodies. The chorioid is most frequently ruptured, especially at the posterior pole, carrying the retina with it, generally from an indirect blow, and most frequently by contrecoup. In most cases this rupture is vertical and temporal to the disc; occasionally it may be multiple. Retinal tears may result in detachment. Trauma to the head and eye may also break the suspensory ligament and cause dislocation of the lens.

Edema, inflammation, and hemorrhage, and possibly interference with circulation of the cerebrospinal fluid as a result of damage to the brain and meninges may cause compression of the brain. This results in papillary changes with edema and a few hemorrhages. True papilledema usually does not appear until from the third to the eighth day. As the compression increases, consciousness may be lost, the cornea may become insensitive, and the pupil on the side of the injury may become dilated and fixed (it is usually first contracted from early irritation). Later, the opposite pupil may become constricted and then dilated.

Hemorrhages may be extradural or subdural, subarachnoid or intraventricular, or they may occur in the tissues of the brain; and they may occur at the time of the injury, or later as the result of cleavage. In the case of extradural or subdural hematomas there may be papilledema, extraocular muscle paralysis, or homonymous hemianopsia (if the patient is conscious). Subarachnoid hemorrhages are most likely to cause paralysis of the eye muscles and hyperesthesia, or anesthesia of the cornea. Pupillary changes are important in the diagnosis of cerebral injuries. A dilated and fixed pupil on one side, seen shortly after an injury and especially when ptosis is present, indicates a laceration of the third nerve or its nucleus. When it appears later it usually implies an intracranial hemorrhage, especially an extradural clot. Because of the importance of the pupillary reactions mydriatics should not be used for fundus examinations in these cases. Pressure on or damage to the cerebral cortex may cause a horizontal conjugate deviation of a fleeting nature.

Skull fractures cause eye symptoms most frequently when they are basal. The abducens nerve is most frequently affected, the oculomotor next. The optic nerve too may be injured or even avulsed. Other nerves and vessels may be involved according to the location of the fracture.

WILLIAM A. MANN, M.D.

Stieren, E.: Intraocular Foreign Bodies. *J. Am. M. Ass.*, 1943, 123: 880.

Prompt and proper treatment of eyes containing foreign bodies may save many injured eyes, with varying degrees of vision. The history of the accident is important, especially that relating to whether the foreign body is magnetic or nonmagnetic. An immunizing dose of 1,500 units of tetanus antitoxin should be given, less for its specific action than as a foreign protein. The foreign body should then be localized, either by ophthalmoscopy, if the media are clear, or with the x-rays if they are not clear. Any foreign body within the eye, except optical glass, is radio-opaque and if the report is negative repeated examinations with plates of different densities should be made.

With the exception of glass (which appears to be inert), all foreign bodies act as continuous irritants by electrolytic and oxidative processes, metals slowly dissolving in the intraocular fluids. Brass and copper are particularly toxic while iron or steel causes siderosis and chronic uveitis. Retained glass tends to become encysted.

Sodium pentothal is recommended for the removal of sharp foreign bodies from the iris. This will keep the patient from squeezing his lids with loss of the foreign body in the vitreous. If the foreign body is in the lens, that too should be removed at the time of the operation with thorough irrigation of the anterior chamber.

The author prefers a conjunctival flap to corneal sutures in lacerations of the cornea; a prolapsed iris should be removed. If the ciliary body contains the wound of entrance, immediate enucleation of the eye is advised to avoid sympathetic ophthalmia.

In the author's experience, only about 10 per cent of all foreign bodies have proved to be nonmagnetic. After accurate localization these are removed through a large scleral opening with the use of a special forceps. If as much as one-fourth of the vitreous escapes, or if there is too much manipulation, the globe is likely to develop a low tension and slowly deteriorate. Because of this, the author believes that only the cone-shaped or olive-shaped tips should be used with the magnet. He prefers the hand magnet to the giant magnet, believing that the latter may cause injury. Magnetic foreign bodies in front

of the posterior lens capsule are removed through the cornea; those in the vitreous, ciliary body, and optic nerve are removed through a scleral incision. The wound of entrance can seldom be utilized.

The scleral incision, preferably T-shaped, should be large enough to permit removal of the foreign body and should continue through the retina. After removal of the foreign body has been completed, pure phenol, which produces an adhesive chorioretinitis, is applied to the wound. No retinal detachments have occurred following the use of this technique. Diathermic punctures have not been used because of the length of time that this would involve.

Infections and inflammations of the anterior uveal tract are treated by foreign protein injections; sulfonamides have not proved too efficacious. In cases of infection in the vitreous, enucleation is indicated. Infection is more likely to occur when the foreign body enters through the cornea than when it enters through the sclera. WILLIAM A. MANN, M.D.

Cogan, D. G., Kinsey, V. E., and Drinker, P.: Infra-Red Therapy of Flash Keratoconjunctivitis. *J. Am. M. Ass.*, 1943, 123: 883.

The authors report the results of their experiments with infra-red therapy in flash keratoconjunctivitis. After anesthesia with one drop of 1 per cent pontocaine solution, the eyes of 10 rabbits were exposed to an 85-watt mercury vapor arc at a distance of 15 cm., until experimental keratoconjunctivitis developed.

Five hours later, after the lesions became apparent, alternate eyes were treated with a therapeutic heat lamp placed 15 cm. from the eye. This permitted the passage of ultraviolet rays of less than 3.100 angstroms, and the delivery 0.75 gm. calorie per square centimeter per minute.

The authors found no evidence that the keratoconjunctivitis was improved by this form of therapy. JOSHUA ZUCKERMAN, M.D.

Bedell, A. J.: Distribution of Epidemic Keratoconjunctivitis in the United States. *J. Am. M. Ass.*, 1943, 123: 1101.

The author discusses the distribution in the United States of epidemic keratoconjunctivitis—an acute disease which affects not only the conjunctiva but also the cornea. Only 4 large outbreaks have occurred in the continental United States: at Seattle, San Francisco, Portland, Oregon, and Schenectady.

The author points out that keratoconjunctivitis is not a new disease, that it is not conclusively a shipyard disease per se, and that it is possible that several other diseases have inadvertently been included under the title of "epidemic keratoconjunctivitis."

Examination of the geographic distribution of the disease proves that the epidemic did not spread throughout the entire United States. Epidemics have occurred in many other countries: England, the Balkans, Germany, Tasmania, China, and Japan. JOSHUA ZUCKERMAN, M.D.

Mann, I., and Pullinger, B. D.: Mustard-Gas Lesions of the Eyes. *Am. J. Ophth.*, 1943, 26: 1253.

Observation over a period of years of patients suffering from mustard-gas burns of the cornea, with recurrent ulceration, which occurred during World War I, and the belief that similar accidents will occur during the present war led to the study of this type of lesion. The authors used rabbits in carrying out their experiments. The sequence of events which follows the application of mustard gas to the eye depends upon the anatomic site of application, and the dose. When these were similar, the results proved quite constant, which suggests a chemical reaction rather than a biological response.

When mustard gas was applied directly to the cornea, it destroyed the corneal epithelium in two or three seconds, and, if left in contact, it reached Descemet's membrane and the endothelium in two minutes. In six and one half minutes it had passed through the aqueous, reached the iris, and had caused a hyperemia. After a period of four minutes none of the droplets of mustard gas remained on the surface of the cornea. After a period of twenty-four hours there was an increased conjunctival hyperemia, edema about the areas of application, and edema of the substantia propria. This is thought to be due to destruction of the cells of the cornea as the liquid passes through it.

When applications of mustard gas were made at the limbus, the conjunctival vessels invaded the cornea after about nine days and a secondary edema occurred. If the dosage was increased and the lid also was treated, there was increased discharge, recurrent thromboses, formation of blood islands, deposition of cholesterin and fat, persistent edema, the formation of fibrous tissue, and cellular infiltrations.

The lesions observed in the human being were quite comparable to those seen in the experimental animals. In considering the lifetime of a rabbit as being one-tenth that of man, and its reactions ten times as fast, the time relationship was found to be quite consistent. As in rabbits, the reaction is dependent upon the anatomic position and the size of the dose. The "late keratitis" seen as late as after twenty years can be explained by observations of the rabbits' eyes.

Ten cases of mustard-gas burns of the eye in man were observed, in which the exposure had been very slight and seemed limited to the conjunctiva, without subsequent corneal damage. In 9 cases the epithelium only was damaged and healing was not delayed. In 4 cases there was involvement of the substantia propria with consequently more extensive damage and delayed healing.

In the very severe cases the late secondary ulceration (so-called "delayed keratitis") occurs, and more than 100 cases of this type have been studied. The typical cases show visual deterioration, with recurrent ulcers, cholesterin crystals, fatty degeneration, and a silkiness with the slit lamp. There is nearly always an astonishing improvement in vision with contact lenses because of the substitution of the

smooth glass for the rough and irregular corneal surface. A typical picture of these cases is described as follows:

". . . an eye in which the upper part of the cornea and the limbal loops are normal. Across the center and lower part runs a band of opacity stretching between the white areas on the conjunctiva in which the limbal loops are absent and the few vessels there are, are badly formed. The scar shows great irregularity of surface. At its edges and in its base are cholesterin crystals. It is vascularized by peculiarly contorted and varicose vessels which enter through the normal limbus above and below the worst scars. There may be narrow constrictions, blood islands, intracorneal hemorrhages, and thromboses. The scar shows, in addition to the cholesterin, white flocculent masses of fatty degeneration, patches of a fibrillar silky texture, and black and gray lines of a peculiar distribution. All these changes, except the black lines, have been reproduced in rabbits. The pathology, therefore, appears as a slow degenerative process. It is initiated by direct chemical action which produces injury and intense edema. These two factors combined allow invasion of the cornea by newly formed blood vessels that are extremely abnormal in form. They are derived from both normal and injured conjunctival vessels. As the corneal vessels slowly retrogress in the course of years, blood may be left in the substantia propria. Vascular regression is followed by cholesterin and fatty degeneration which are responsible, alone or combined, for the "delayed keratitis."

Cases in which corneal perforation has occurred are extremely rare. In most of the severe cases which occurred in World War I, the patients were confined for some hours in an enclosed space, in vapor. All were severely ill and several became unconscious. The average stay in the hospital was six months, and the eyes were closed (on an average) for seven weeks. It would seem better not to bandage these cases. Prophylaxis is more important than treatment, and it is difficult to assess the value of treatment in man.

WILLIAM A. MANN, M.D.

EAR

Lord, O. C.: Osteoclastoma of the Temporal Bone. *J. Lar. Otol.*, Lond., 1943, 58: 263.

Osteoclastoma of the temporal bone is a very rare disease. The author was able to find but 2 well-authenticated cases in the literature.

He describes a case of osteoclastoma of the temporal bone in a woman fifty years old, with a clinical duration of just over three years. The histological diagnosis was made two years before death after examination of a recurrent aural polyp. Treatment by partial excision and radiation appeared to give good results for a time. However, at post-mortem examination the tumor was found to have extended widely into the base of the skull and had invaded the cerebellum after breaching the dura mater, but there were no changes in the histological characteristics and no evidence of metastasis.

NOAH D. FABRICANT, M.D.

MOUTH

Robbins, G. F.: Tumors of Salivary-Gland Origin. *Surgery*, 1943, 14: 924.

Fifty-six cases of tumors of salivary-gland origin (mixed tumors) have been studied by members of the staff of the New York Post-Graduate Hospital. The distribution of these tumors, and their gross and microscopical anatomy are described, and their clinical behavior and the difficulties of diagnosis, especially as regards recurrence, are discussed.

To inhibit their recurrence, it is necessary to resort to radical surgical excision. Metastases occur rarely in cases of this type.

WILLIAM G. SKILLEN, D.D.S.

SURGERY OF THE NERVOUS SYSTEM

PERIPHERAL NERVES

Lewin, W.: Pressure Palsy in the Paralyzed Limb. *Lancet*, Lond., 1943, 245: 756.

The vulnerability of the lateral popliteal nerve to compression as it winds around the neck of the fibula is well known. This is due to its superficial position, since the nerve lies over a bony prominence.

Such a peripheral nerve paralysis superimposed upon a paretic limb due to a cerebral or spinal lesion would be difficult to determine clinically, and therefore the condition is apparently often overlooked.

Clinically, the lesion may be suggested by paralysis of the peroneal and anterior tibial muscles, disproportionate muscular atrophy, their failure to participate in a mass reflex when spinal paraplegia is present, sensory loss when distinguishable, and flaccidity of the muscle group in a spastic limb.

Recent investigations with electromyography have shown that in lower motor-neuron lesions there is present a fibrillating-action potential. This has been utilized with great effect.

Sweating reactions with the quinizarin method were also used to show the absence of sweating in the area supplied by the peripheral nerve. This has been diagnostic in the cauda-equina lesions, for here there is also a peripheral-nerve lesion; however, since the sympathetic nerves leave the cord at a higher level, there is no absence of sweating.

Of the 5 cases reported, 3 were due to faulty posture of the paretic limb in bed, 1 to pressure of a plaster back splint, and 1 to prolonged pressure from enforced lying on the paretic side.

The fact that 5 cases have been seen in a short period of time suggests that such lesions are much more common than is suspected. However, they can be prevented by careful nursing and the careful application of padded casts. JACK I. WOOLF, M.D.

Spurling, R. G.: The Use of Tantalum Wire and Foil in the Repair of Peripheral Nerves. *Surg. Clin. N. America*, 1943, p. 1491.

The present report presents the technique of end-to-end nerve anastomosis with the use of tantalum wire and foil. Although the results of this procedure will be given in a separate report, the author has found that the results closely follow those obtained in the experimental work of Young and others in delayed suturing.

Several objections to the regular method of nerve repair by end-to-end anastomosis have been the inflammatory reaction with the use of silk and more so with catgut, and also the replacement of the sutured nerve in the former cicatricial bed. These criticisms are obviated by the use of tantalum wire with its lack of inflammatory reaction and by the application of foil about the nerve to prevent involvement of the nerve by the extrinsic cicatrix.

The cardinal principles in any type of nerve repair are emphasized. Tension is overcome by extensive dissection and transplantation if necessary. Careful hemostasis is obtained by applying a muscle stamp over the trimmed nerve ending. After several minutes it is flushed off with a stream of normal saline solution. Orientation is maintained by the application of small silk sutures in the perineurium in the same plane above and below the lesion. These are later removed.

By the use of a sling stitch, which is a through-and-through stitch, a more exact approximation of the nerve ends is obtained. A series of 3/1,000 tantalum sutures are then used to approximate the perineurium. After verification of hemostasis and after a dry field has been obtained, a cuff of tantalum foil is applied and maintained by circular suture ties.

If only partial severance is made or a neuroma is excised and repaired, a strip of foil is used.

Another advantage of the tantalum is that a check-up on either the maintenance of the anastomosis or the formation of a neuroma may be made by the use of x-rays.

One case that was reoperated upon four and one-half months later presented an opportunity to determine the reaction to tantalum. The foil was found to be fragmented and the adjacent structures were smooth and glistening. The anastomotic site could not be made out.

Biopsy specimens were obtained and were reported by Lind, Jr., as revealing a layer of delicate connective tissue adjacent to the tantalum without either inflammation or giant-cell formation. "Of considerable anatomical interest is the similarity in structure to vessel or cavity wall." JACK I. WOOLF, M.D.

Hammond, W. S., Nonidez, J. F., and Hinsey, J. C.: The Effect of Various Sulfonamide Compounds on Nerve Regeneration. *Arch. Neur. Psychiat.*, Chic., 1943, 50: 499.

Although several studies of the effect on wound healing resulting from the use of the sulfonamides have been reported, no studies have been made on the effect of the local application of the sulfonamides on nerve regeneration.

Sulfanilamide, sulfathiazole, sulfapyridine, and sulfadiazine, in quantities of 0.25 or 0.5 gm., were placed on the sciatic nerve of the cat following simple nerve section, primary suture, and suture delayed five days after the injury. The other nerve was used as a control. The animals were sacrificed two, five, ten, fifteen, and thirty days postoperatively.

It was seen that nerve regeneration per se was in no way affected by the use of the sulfonamides. However, the slow absorption of certain of the compounds acted as a temporary mechanical block. This was never seen after the use of sulfanilamide, and in

ABSORPTION OF DRUG

0.5 gm.	Number of observations	Days after operation				
		2	5	10	15	30
Sulfanilamide	10	−	−	−	−	−
Sulfathiazole	11	+	+	+	−	−
Sulfapyridine	10	+	+	+	+	−
Sulfadiazine	8	+	+	o	+	−
0.25 gm.						
Sulfanilamide	6	o	−	−	−	−
Sulfathiazole	4	o	+(trace)o		−	−
Sulfapyridine	6	o	+	+	−	−
Sulfadiazine	10	+	+	+	+	−

In this table, − indicates "absence of the drug"; + indicates "presence of the drug," and o indicates "no observation."

none of the cases were sulfanilamide crystals seen in the wound inspected after forty-eight hours.

The above table reveals the approximate rate of absorption.

Serous exudate was not observed in the wound.

"Other than the production of a foreign body reaction, the local application of the sulfonamide compound had no specific effect on the connective tissue sheaths," and with the use of sulfanilamide, even the foreign-body reaction was not seen, probably because of the rapidity of absorption.

An excellent description of nerve regeneration is given, accompanied by several drawings made under high-power magnification. "The new nerve fibers are of small and medium size. Thick axons do not regenerate as such, but produce a variable number of small and medium-sized fibers. The new fibers do not penetrate the old myelin sheath pathways but pass down beside them, presumably in a schwannian syncytium or between the sheaths of the endoneurium. A definite schwannoma was not observed."

JACK I. WOOLF, M.D.

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Hawkes, C. D.: Prognosis in Prolonged Unconsciousness Following Head Injury. *Am. J. Surg.*, 1943, 62: 336.

As the author points out, the problem of prognosis in cases of prolonged unconsciousness following cerebral trauma, in which indications for operative interference are not indicated, has been given comparatively scant attention in the literature.

In a group of 224 patients, 30 remained unconscious for a period of longer than seventy-two hours. The mortality rate of the latter was 17 per cent while that for the whole group was 12 per cent.

In these 30 cases it was noted that the average age of the survivals was twenty-seven years, while the average age of the patients who died was fifty-six years. Further subdivision reveals that the average age of the patients with inoperable injuries was twenty-eight years while that of the patients with operable injuries was forty-four years.

The treatment followed the recognized principles of the present day. The author believes that usually lumbar puncture is not necessary, and that it is certainly disturbing to the patient. Although a differential diagnosis of the operable cases may be difficult in patients lacking the usual history of the lucid interval, a careful study of the pulse, blood pressure, temperature, respiration, and neurological status will reveal the condition in sufficient time for operative intervention; otherwise the treatment should be conservative.

Of the 25 survivals, 72 per cent made a complete recovery. This very high percentage of cases without residual signs is surprisingly higher than the percentages given in other reports.

JACK I. WOOLF, M.D.

Pennington, L. A., and Mearin, R. J.: Frequency of Craniocerebral Injuries in Relation to Military Screening Examinations. *War Med.*, Chic., 1943, 4: 465.

A survey of the frequency and severity of craniocerebral injuries in relation to military screening examinations is presented. The data collected from the consecutive examinations of 4,822 sailors ranging in age from seventeen to fifty years have been summarized. The method used was interrogation supplemented by neurological examination. In the group mentioned, 634 men, or 13.15 per cent, reported craniocerebral traumas at some time in their lives. Although it is difficult to evaluate the severity of any head injury long after its occurrence, an attempt was made to do this by using as a criterion the duration of the disturbance of consciousness. In addition, neurological observations and roentgen data were considered. Old injuries were thus classified as originally mild, moderate, or severe.

The largest group, 72 per cent of the total number of head injuries reported, were classified as mild. This means that no disturbance in consciousness lasting longer than ten minutes, and very few serious psychiatric sequelae were reported. Injuries of moderate severity (disturbance of awareness lasting from ten to sixty minutes) made up 10.5 per cent of the cases. In this group complaints of psychiatric interest were more common. The remaining 16.9 per cent of the cases were classified as severe because the reported disturbances in consciousness ranged in duration from more than an hour to several days or weeks. In this group positive neurological signs were more often elicited and roentgen evidence of skull injury was more often confirmatory. A study of the nature of treatment received showed that many of the patients, even in the group classified as severe, had received no medical care or rest in bed.

An analysis was also made of the types of accidents causing head injuries. The method used here is offered to the military medical examiner as a

means of eliminating men with severe post-traumatic syndromes prior to admission to basic training units. JOHN L. LINDQUIST, M.D.

Rossen, R., Kabat, H., and Anderson, J. P.: Acute Arrest of the Cerebral Circulation in Man. *Arch. Neur. Psychiat.*, Chic., 1943, 50: 510.

By the use of a specially designed cervical pressure cuff it was possible to occlude the cerebral circulation, with a pressure of 600 mm. of mercury, within one-eighth of a second. The cuff is held down to the lower third of the neck, to occlude not only the common carotid artery but also the first portion of the vertebral artery.

The apparatus is controlled by both the patient and the examiner, and the pressure is relieved when loss of consciousness has occurred.

A rather constant series of reactions occurs. Within five or six seconds there was a central fixation of the eyes, although the patient was still conscious and aware of the inability to move his eyes. About one-half second later, with the onset of unconsciousness, an occasional subject had a conjugate upward deviation of the eyes. A generalized tonic and clonic convulsive seizure occurred after the loss of consciousness, and coincided with release of the pressure and restoration of blood flow. The average time required to produce loss of consciousness was six and eight-tenths seconds.

Electroencephalographic records revealed slow, large delta waves appearing at the time of loss of consciousness.

The corneal reflex was usually lost in less than ten seconds. In prolonged but incomplete arrest of the circulation the abdominal reflex disappeared before the appearance of the Rossolimo and Hoffmann reflexes, while the Babinski sign was seen only very occasionally.

The period of recovery varied from three to eleven seconds. This was thought to vary somewhat with the personality and the emotional influence upon the patient; however, it was shortened by the production of a pre-engorgement of the cerebrum or by the administration of vitamin B.

The authors' calculations reveal that the oxygen utilization of the human brain is 1.56 cc. per second, while the blood flow necessary for this utilization is about 100 cc. per 100 gm. of brain weight per minute. "At rest, the brain receives about one-third of the output of the left ventricle per minute, although it represents only 2 per cent of the body weight."

JACK I. WOOLF, M.D.

Fleming, A.: Streptococcal Meningitis Treated with Penicillin: Measurement of the Bacteriostatic Power of the Blood and Cerebrospinal Fluid. *Lancet*, Lond., 1943, 245: 434.

The author reports the case of a fifty-two-year-old man who was cured of streptococcal meningitis by the intramuscular and intrathecal administration of penicillin. He considers this case particularly worthy of report for the reason that it represented the first one in which intrathecal injections of the drug were tried, and the first one in which the bacteriostatic power of the blood and spinal fluid was systematically titrated throughout the course of treatment. Since there is no chemical test for evaluating penicillin in the blood, the latter method is the only available means of following the effectiveness of the drug concentration in a patient.

As soon as the diagnosis of meningitis had been made, adequate doses of sulfapyridine were administered; however, the organism at fault had not been isolated at the time. The temperature of the patient dropped to normal, but when the drug was withheld there was again a rise. A subsequent course of sulfathiazole proved to be ineffective. When the offending organism (a nonhemolytic streptococcus) had been isolated, cultured, and shown to be completely resistant to sulfathiazole, penicillin was obtained (forty-nine days following the onset of symptoms, when the patient was apparently dying). Intramuscular treatment over a period of eleven days, with four concurrent intrathecal injections of the drug, resulted in complete recovery.

Intramuscular dosage averaged 10 Oxford units every two hours, and intrathecal injections of 2,500 to 5,000 units daily. For one of the spinal injections the drug was diluted by an equal volume (10 cc.) of the patient's serum. This was done as a means of providing opsonic substances which, of course, are lacking in the spinal fluid. Within twenty-four hours after the initiation of penicillin therapy, a marked improvement in the patient was observed. With the exception of two minor occurrences of low-grade fever, the course of the condition was afebrile. There were no reactions to the drug itself.

Following a detailed description of the methods used for micromeasurement of the bacteriostatic power of the blood and spinal fluid, the author demonstrated that the patient's blood had been rendered bacteriostatic over a considerable period of time by two hourly intramuscular injections of penicillin. It was shown further that with intramuscular injections only, the bacteriostatic power of the spinal fluid was less than that of the blood and, therefore, that penicillin did not pass freely from the blood to the fluid. This was rapidly corrected by intrathecal administration. The significance of this procedure becomes apparent when one recalls the need for economical use of a drug that is so difficult to obtain.

This article is well illustrated by tables, and the analytical methods which were employed by the author are clearly described.

ADRIEN VERBRUGGHEN, M.D.

McFarlan, A. M.: The Bacteriology of Brain Abscess. *Brit. M. J.*, 1943, 2: 643.

This article, from the Emergency Public Health Laboratory Service in Great Britain, is a report to the Medical Research Council and concerns the bacteriological findings in 48 cases of brain abscess at various clinics. A table of the various organisms found is shown herewith.

TABLE I.—ORGANISMS FOUND IN 48 BRAIN ABSCESSES. (THE PUS FROM ONE ABSCESS SHOWED NO ORGANISMS IN FILMS AND THE CULTURES WERE STERILE)

	Number of times each organism appeared		
	In pure culture (33 cases)	With other organisms (14 cases)	Total (47 cases)
Staphylococcus aureus	13	2	15
Streptococcus pneumoniae	6	—	6
Proteus vulgaris	2	4	6
Streptococcus pyogenes	4	—	4
Streptococcus viridans	1	1	2
Nonhemolytic streptococcus	2	—	2
Anaerobic streptococcus	1	9	10
Unclassified streptococcus	—	3*	3
Fusiform bacilli	2	8†	10
Micrococcus tetragenus	1	—	1
Anaerobic diphtheroid	—	2	2
Haemophilus influenzae	1*	—	1
Total number of organisms	33	29	62

* Seen in films only.
† Two strains of fusiform bacilli were seen in films only.

As in other representative series of brain abscess, the organisms found were in much the same relation to one another. The staphylococcus aureus was the most common. However, the presence in 10 abscesses of anaerobic streptococci made it clear that anaerobic culture is an essential part of the examination of pus from brain abscesses. In the 13 well encapsulated abscesses there seemed to be no relation between the speed and degree of encapsulation and the organism found on culture. The findings also tended to disprove the suggestion that capsule formation is weak in the presence of anaerobic or Gram-negative bacilli. ADRIEN VERBRUGGHEN, M.D.

Bennett, A. E., Keegan, J. J., and Wilbur, C. B.: Prefrontal Lobotomy in Chronic Schizophrenia. *J. Am. M. Ass.*, 1943, 123: 809.

The authors report a series of 5 cases of schizophrenia which were treated by prefrontal lobotomy. Of these, 4 were of the aggressive paranoid type and resulted in "good social recovery"; in the remaining case of catatonic schizophrenia the condition failed to improve.

Previous studies of undifferentiated types of schizophrenics have been made by Freeman and Watts, Schrader, and Peterson and Buchstein, all of whom have reported good results in approximately 50 per cent of their cases.

The original technique of Egas Moniz was first altered and used in this country by Freeman and Watts. However, the authors of this article prefer a modification of the technique suggested by Lyerly in 1939, since it is further removed from Broca's motor speech area and from the motor cortex of the face. This incision is made approximately 4 cm. from the midline and approximately 3 cm. anterior to the motor cortex of the arm. The incision into the cortex may be made to a depth of from 5.5 to 6 cm.

Postoperative treatment requires good nursing care, particularly for the first few days to a week following operation, during which time the patient usually is stuporous and in a state of apathy and inertia; and it is important that the nurse and the family of the patient re-educate him in the basic requirements of defecatory habits, cleanliness, dressing, and eating. Also, instructions in simple occupations and activities are necessary.

Prefrontal lobotomy, devised by Egas Moniz and perfected by Freeman and Watts, has been established as a useful procedure in psychiatric treatment. In the opinion of the authors, its usefulness should be investigated further; at present its use should be limited to chronically disabled psychotic patients who have failed to show improvement following other methods of treatment. It should not be used in psychoneuroses, nor in affective states until the patients have been proved to be totally refractory to other methods of treatment.

JACK I. WOOLF, M.D.

SPINAL CORD AND ITS COVERINGS

Fleiss, A. N., and Ingham, H.: Cord-Compressing Lesions with Normal Queckenstedt Sign. *J. Am. M. Ass.*, 1943, 123: 759.

The possibility of finding a surgical lesion in the absence of a spinal-fluid block has worried neurological surgeons for many years, and from time to time groups of cases of this kind have been reported in the literature.

In the neurological service at Bellevue Hospital (Cornell Division), in New York, during a thirteen-year period, 20 patients suspected of having a compressing lesion of the spinal cord above the second lumbar vertebra were operated upon. These patients had rather definite sensory levels, but there was no spinal-fluid block. A study was made as to the possibility of error, in regarding the absence of block as conclusive evidence against the presence of an expanding lesion.

Of the 20 patients, 10 showed some pathological process which pressed on the spinal cord, and for which surgical treatment was indicated. Of these 10, 6 had a definite space-occupying lesion in the absence of spinal-fluid block. However, of these 6, 4 showed a greatly increased total protein, between 100 and 200 mgm. per 100 cc. Three of the 6 patients had ruptured intervertebral discs, all of which were in the cervical region; the other 3 had meningiomas. The remaining 4 (of the 10) cases displayed adhesive arachnoiditis of various kinds.

The 10 cases with surgical exploration, or 50 per cent of the patients in this series, showed a normal

appearance of the spinal cord, atrophy of the cord, or some other noncompressing pathological change.

The author's conclusions following their study are as follows:

It is believed that this study indicates the advisability of surgical exploration in a patient suspected of having a "level lesion" of the spinal cord despite the absence of spinal-fluid block.

It is also seen that a high protein content of the spinal fluid (above 100 mgm. per 100 cc.) in such a patient is strongly suggestive of a localized compressing lesion, whereas the presence or the absence of sacral "saddle" anesthesia and the preciseness or the vagueness of the sensory level may not be of great significance in the diagnosis.

ADRIEN VERBRUGGHEN, M.D.

Shidler, F. P., and Richards, V.: Anterior Sacral Meningocele. *Ann. Surg.*, 1943, 118: 913.

Three cases of anterior sacral meningocele are reported. This is a rare congenital anomaly associated with congenital absence of half of the sacrum. Symptoms due to anterior sacral meningocele are produced by pressure of the tumor on pelvic viscera.

From the 3 cases reported only one complete history and operative procedure is available. The patient was a white female, age twenty-nine, who had had lifelong constipation. Pelvirectal examination revealed a huge mass which completely filled the left pelvis. Roentgenograms showed congenital absence of the left portion of the sacrum and anomalies of the 4th and 5th lumbar vertebrae. Aspiration of the mass yielded about 200 cc. of cerebrospinal fluid and caused the mass to disappear. The following day lumbar puncture was done and 1 cc. of lipiodol was introduced into the subarachnoid space. On roentgen examination it was seen that the lipiodol did not enter the mass or leave the spinal canal until two weeks later, when all of the lipiodol could be visualized in the meningocele.

Operation was carried out through a posterior incision and a tumor 14 cm. in diameter was found. Examination of the opened sac revealed no visible nerve elements. The sac was dissected free of pelvic viscera and amputated. Small openings in the spinal canal were closed with silk mattress sutures. Recovery was uneventful except for an infection in the dead space which was drained through the wound.

JOHN L. LINDQUIST, M.D.

MISCELLANEOUS

Eden, K.: Mobile Neurosurgery in Warfare: Experiences in the Eighth Army's Campaign. *Lancet*, Lond., 1943, 245: 689.

In the earlier phases of the North African war, cranial injuries were evacuated to the base hospitals for treatment. However, the advancement of the front and the lengthening of lines of communication made this an impractical procedure. Hence, mobile neurosurgical teams were sent to the front.

By means of a reconstructed motor coach, a well equipped operating theater was constructed. This unit contained all the essentials for neurosurgery.

The preoperative and diagnostic measures which were considered essential were a complete neurological examination, and roentgenography. Lumbar punctures were not considered informative enough at this early stage, and therefore were not done. Shaving the entire head was a routine measure.

Anesthesia was usually obtained by local infiltration with 1 per cent novocain supplemented with omnopon and scopolamine. However, in cases in which regional block was precluded, or in which a restless confusional state was present, the endotracheal administration of cyclopropane or the continuous drip method with ½ per cent sodium pentothal was used. Operative technique was in accord with the routine neurosurgical treatment of the present day; i.e., débridement, adequate but sparing, and cleansing of the brain track by suction and irrigation. Complete closure in two layers was routine. The wound was dusted with sulfathiazole, and a rubber stab drain was inserted for one or two days.

The patients were usually kept at this point for two or three days and then evacuated by air to the base. It was noted that healing by first intention occurred in only 29.8 per cent of the cases which reached the base hospital and had been operated upon by a general surgeon. In cases in which the initial operation had been performed by the neurosurgical team, healing by first intention occurred in 85 per cent. As some wounds in which primary healing occurred were from eight to ten days old when they were first seen and repaired, "the bogy of sepsis is largely dispelled."

The author believed that enough time had not elapsed to draw conclusions as to the final outcome in these cases.

JACK I. WOOLF, M.D.

SURGERY OF THE THORAX

TRACHEA, LUNGS, AND PLEURA

Galloway, T. C.: Tracheotomy in Bulbar Poliomyelitis. *J. Am. M. Ass.*, 1943, 123: 1096.

The author reports the cases of 2 patients who he believes were undoubtedly saved by tracheotomy, and the case of a third patient who might have been saved by this procedure had it been done a little earlier. All 3 patients were suffering from a bulbar type of poliomyelitis.

The first patient was a thirty-six-year-old male who had been ill four days. He had suffered dizziness and stiffness of the neck for two days, and had experienced difficulty in swallowing for one and one-half days at the time of his admittance to the hospital. Clinical and laboratory tests confirmed the diagnosis of bulbar poliomyelitis. The author first saw the patient when he was semicomatose, cyanotic, and breathing spasmodically, after an effort to swallow some food. He failed to respond to postural drainage, a rubber airway, and to constant aspiration of the laryngeal and tracheal contents. A rapid median tracheotomy was performed. Breathing ceased for about three minutes. Following aspiration by catheter through the tracheotomy wound and manual artificial respiration, he was placed in a respirator where he remained for a period of eleven days. Twenty-one days after the operation the tracheotomy tube was corked, and two days later it was removed.

The second patient was a twelve-year-old girl, in whom a tracheotomy was done because of symptoms similar to those in the first patient. The tracheotomy tube was removed on the tenth postoperative day.

The third patient was a nineteen-year-old boy who died while preparations for a tracheotomy were being made; death occurred as the patient was taken from the respirator preparatory to being removed to the operating room.

There is a normal secretion of saliva of from 1,000 to 1,500 cc. per day, and to this is added the normal or inflammatory nasal, pharyngeal and, perhaps, bronchial secretion. If this cannot be swallowed or completely expectorated, coughed out, or aspirated, it will find its gravity level, where it may lie as a pool over and in the airway. If relief cannot be given by postural drainage, including the effective face-down position, and by aspiration, tracheotomy is indicated.

EARL O. LATIMER, M.D.

Kipp, H. A.: The Surgical Treatment of Bronchiectasis. *Pennsylvania M. J.*, 1943, 47: 117.

Chronic bronchiectasis is a progressive disease of the bronchi with increasing and permanent dilatation of the infected portions of the lung. In its early stages physicians are unaware of its dangers since the symptoms are mild, and therefore no curative form of treatment is undertaken. In patients recovering from pneumonia, in whom the lower portion of the lung shows evidence of congestion and increased bronchial shadows, or atelectasis, an examination should be made to eliminate the possibility of bronchiectasis. During the early stage of the disease this may be accomplished by intratracheal instillation of contrast oil media followed by x-ray examination.

There are two classes of patients with bronchiectasis who should be treated conservatively, i.e., by medicine, postural drainage, and bronchoscopic aspirations: (1) those in whom the disease has been diagnosed early and in whom irreversible damage has not been done, and (2) those in whom the disease is so far advanced that their general condition contraindicates surgical treatment. In the latter group, bilateral or multilobar involvement may not contraindicate surgical treatment as much as the peribronchial destruction and infection in the surrounding lung, or the involvement of other organs.

The co-operation of the bronchoscopist, the surgeon, and the internist is necessary in preparing the patient for surgical treatment. The operation is best performed through the bed of the seventh or eighth ribs and, if possible, individualization of the hilar structures is preferable to the tourniquet technique. Following operation, drainage of the pleural space is carried out and oxygen is administered by tent or mask. Blood transfusions are important.

The author presents a report of 7 cases with no operative deaths. These included 1 total pneumonectomy, 1 middle and lower lobectomy, and 5 lower lobectomies. One patient died four months after operation of a massive hemorrhage from an unhealed bronchial fistula. The condition in 2 patients was bilateral and there has been much improvement. They are awaiting further surgical treatment. The other 4 patients are feeling well.

WILLIAM E. ADAMS, M.D.

Johnson, E. K., and Reinhart, H. L.: Necropsy Incidence of Carcinoma of the Lung. *Ohio M. J.*, 1943, 39: 1017.

The present report concerns the question of whether pulmonary cancer is on the increase. In a twenty-five-year period from January 1, 1917, to January 1, 1942, 66 cases of pulmonary carcinoma were found in 8,333 autopsies made on individuals from twenty-eight to sixty-nine years of age. The autopsy material was accumulated by the Department of Pathology of the Ohio State University from penal institutions, coroner's and industrial commission cases, and general, mental, tuberculosis, and pediatric hospitals.

Of the 8,076 autopsies showing some type of carcinoma, 8.3 per cent revealed pulmonary cancer and 16 per cent gastric cancer. These were spread out over the twenty-five-year period as follows:

From 1917 to 1922: 28 carcinomas, 4 pulmonary and 3 gastric

From 1922 to 1927: 48 carcinomas, 3 pulmonary and 9 gastric

From 1927 to 1932: 99 carcinomas, 9 pulmonary and 19 gastric

From 1932 to 1937: 214 carcinomas, 13 pulmonary and 42 gastric

From 1937 to 1942: 398 carcinomas, 37 pulmonary and 56 gastric

From this data it is suggested that the increase of pulmonary and gastric carcinoma was proportional to the increase of all carcinoma and that the increase in pulmonary carcinoma was therefore relative and not absolute.

On a microscopic basis the pulmonary cancers were divided into three groups: namely, small-cell carcinoma, squamous-cell carcinoma, and adenocarcinoma. WILLIAM E. ADAMS, M.D.

HEART AND PERICARDIUM

Beck, C. S.: Principles Underlying the Operative Approach to the Treatment of Myocardial Ischemia. *Ann. Surg.*, 1943, 118: 788.

The operative approach to the problem of coronary-artery disease and myocardial ischemia by the author and his associates had been preceded by extensive experimental work on revascularization of the heart. Coronary-artery disease is compared to epilepsy. The trigger in the heart "fires," or discharges, and produces a state of inco-ordinated contractions and relaxations of the heart muscle fibers. This is the well known "heart attack" and is fatal. A small amount of blood to the zone of anoxemia can prevent the trigger from "firing." This may be regarded as a blood bath.

The author's experiments have demonstrated that there are three methods of approach for the production of a blood bath. The first method is by the establishment of extracoronary communications produced by the grafting of tissues upon the heart. The second method is by the establishment of intercoronary communications. This can be accomplished by producing inflammation on the surface of the heart. It was found that 0.2 gm. of powdered asbestos was a safe inflammatory agent, that it produced a highly vascular reaction between the heart and the surrounding tissues, that the reaction was not too severe, and that it extended over a period of months. The third method of approach for the production of a blood bath is by the provision of a time factor so that good intercoronary communications can be developed; this has been provided by the establishment of extracoronary communications and by the effect of inflammatory agents on the heart. The effectiveness of these experimental procedures is illustrated by photographs, in color, of heart specimens.

The application of these ideas and procedures to patients with coronary-artery disease is presented as follows:

Requirements for operative treatment

1. Localized arterial and myocardial disease require a blood bath which can be provided by operation and which can prevent:
   a. Infarct formation
   b. Ventricular fibrillation
2. Extensive arterial and myocardial disease require a new set of arteries and a new myocardium which cannot be provided by operation.

Classification of coronary-artery disease

1. Trigger types with anoxemic heart muscle which may produce ventricular fibrillation
   a. Threat to life
   b. Blood bath to trigger area is prophylactic
   c. Types
   (1) Patients with little or no destruction of myocardium
      (a) Have the least risk
      (b) Obtain the best result
   (2) Patients with definite destruction of myocardium. The degree determines
      (a) Risk
      (b) Result
2. Nontrigger type with approaching myocardial failure
   a. Extensive destruction of myocardium
   b. Optimal period for operation has passed as concerns risk and result

Present operative technique. Light nitrous-oxide anesthesia is used. The incision is curved along the left sternal border over the fourth, fifth, and sixth costal cartilages, and laterally along the sixth rib. It is carried through underlying muscle to the third rib and costal cartilages. The fourth, fifth, and sixth costal cartilages are removed completely. A few centimeters of each of these ribs are also removed. The pleura is incised where these structures were removed and the pleural cavity is entered. The tissues between these incisions are left intact. The internal mammary artery is left intact. The inflation of the lungs is regulated so that the left lung comes well up with inspiration and collapses nicely with expiration. The anterior parietal pericardium is opened to bring the heart into direct contact with the chest wall. The pericardium is then sutured to the precordium in such a way that the heart will not be rotated from its normal position. The lining of the parietal pericardium everywhere is roughened by special burs. Powdered asbestos, 0.2 gm., is then applied to the heart. Some of this is rubbed into the parietal pericardium with a bur and some, mixed with saline solution, is dripped upon the heart and along the mammary artery and vein. Mediastinal fat is brought in through openings in the parietal pericardium so that it comes into contact with the heart. The parietal pericardium is sutured to the chest wall so that the heart and the precordium are in contact. It is advisable not to touch the heart any more than necessary. Closure without drainage is then carried out.

Postoperative care. The patient is placed in an oxygen tent. Fluid in quantities of from 3 to 5 liters

is given intravenously, daily. Quinidine is given before and after operation. A test dose of 3 gr., followed by 5 gr., is given the night before the operation. An additional dose of 5 gr. is given in the morning before operation. Morphine is given as is necessary. Usually fluid does not collect in the left pleural cavity. If it does form, it can be left to absorb or it can be removed by aspiration.

Results of operation. The best way to judge the effectiveness of the operation is to take patients whose clinical course has become stabilized and let each patient become his own control. The patients who recovered from the operation were partially or completely relieved of pain. Their ability to get around was increased; some of them are doing hard physical work. ERNEST E. ARNHEIM, M.D.

Feil, H.: Clinical Appraisal of the Beck Operation. *Ann. Surg.*, 1943, 118: 807.

This report summarizes the results obtained by Beck and his associates in their attempts to revascularize the heart.

TABLE I.—APPRAISAL OF THE BECK OPERATION

Case	Age	Survival period		Living	Dead	Condition after operation
		Years	Months			
1	56	8	5	+		Excellent*
3	53	2	6		+	No improvement
4	57	8	0	+		Good†
6	61	6	1		+	Excellent
9	51	5	8		+	Excellent
11	49	7	4	+		Excellent
13	58		6		+	No improvement
15	54	6	0		+	Excellent
17	56	6	7	+		Excellent
18	53	5	1		+	Excellent
19	55	6	7	+		Excellent
20	70	2	3		+	Excellent
21	57	6	5	+		Good
22	48	6	5	+		Excellent
23	55	6	4	+		Good
24	47	1	3		+	Little improvement
25	57	6	2	+		Excellent
26	56	5	11	+		Excellent
27	53	5	11	+		Excellent
28	55	5	10	+		Good
31	54		4		+	No improvement
36	59		9	+		Excellent
37	35		6	+		Good

*Excellent: Sufficient improvement to permit patient to return to his former occupation, with no or minimal symptoms.
†Good: An increase in exercise tolerance and diminution in symptoms.

The prognosis in cases of disease of the coronary arteries is variable, but in general it is poor. Conventional medical therapy does not alter appreciably the underlying pathological changes in patients with coronary sclerosis. The results obtained with Beck's operation, in which the attempt is made to increase coronary circulation by producing inflammation on the surface of the heart and implanting grafts upon the heart, are encouraging.

Thirty-seven patients were operated upon by this method. The results are shown in the accompanying table. Twenty-three patients survived the operation. Of these, 9 died after from four months to six years. At autopsy, all were found to have had severe coronary disease. Fourteen patients are still alive. Nine are free of symptoms or have only minimal symptoms, and have shown sufficient improvement to enable them to return to their former occupations. Five have shown an increase in exercise tolerance and their symptoms have decreased.

The case records of all patients operated upon are abstracted briefly. EDWARD W. GIBBS, M.D.

ESOPHAGUS AND MEDIASTINUM

Paul, L. W.: Roentgenological Aspects of Acute and Chronic Esophagitis. *Radiology*, 1943, 41: 421.

Although esophagitis is commonly seen secondary to other conditions, there is a distinct group of inflammations, both acute and chronic, which may affect the esophagus and which, in so far as the esophagus is concerned, are responsible for the primary lesion in that organ.

The author refers to reports in the literature to emphasize the frequency of this condition, and his own material showed 96 cases of acute and chronic esophagus inflammation in a series of 570 necropsies. In 26 of the 96 cases some form of negative suction apparatus had been used; frequent vomiting was a feature in 10 cases, and a stomach tube had been passed on one or more occasions in 14 cases. The author points out that Wangensteen stated he had seen no ill effects from the use of suction apparatus in more than 5,000 examinations.

Some of the most significant symptoms of esophagitis are substernal pain, dysphagia, and hemoptysis. In the author's experience, difficulty in swallowing has been the major complaint. He reports 5 cases which bring out some of the more salient features of the condition. In certain of these cases some form of suction apparatus had been used; in others there was no history of any form of trauma to the esophagus. One patient had a congenitally short esophagus with a hiatus hernia; 1 patient had esophagitis associated with a ruptured duodenal ulcer; the condition in another patient brought out the difficulty of differentiating between peptic esophagitis and diffuse spasm of the esophagus. Seven cases of this type were observed by the author during the past six years.

From his experience the author draws the following conclusions:

1. Marked lowering of the resistance of tissues probably plays a role in acute ulcerative esophagitis seen in autopsy specimens.

2. Transient mild esophagitis is probably common but causes little serious trouble.

3. Several features may play a role in the development of acute ulcerative esophagitis, namely, relaxation of the cardia with a reflux of gastric juice, frequent vomiting, the use of the stomach tube, and the trauma and shock associated with upper abdominal operations.

4. Ulcerative esophagitis is commonly associated with duodenal ulcer and often occurs after operative procedures for the relief of ulcers.

5. The characteristic x-ray findings in acute ulcerative esophagitis are as follows:

The lesion is largely confined to the lower third or one-half of the esophagus. At first only an intermittent or continuous spasm is present; however the deformity soon becomes fixed with marked narrowing of the lumen. Peristalsis becomes absent and obstruction is pronounced. The normal mucosal folds through the contracted area are absent. The lesion may progress to complete stenosis.

In view of the findings the x-ray diagnosis is usually not difficult to make.

WILLIAM E. ADAMS, M.D.

Lindsay, J. R., Templeton, F. E., and Rothman, S.: Lesions of the Esophagus in Generalized Progressive Scleroderma. *J. Am. M. Ass.*, 1943, 123: 745.

Diffuse scleroderma is a generalized disease of connective tissue. Three clinical stages are recognized: the edematous, indurative, and atrophic. The skin first appears to be smooth and tense; it does not pit on pressure and cannot be folded. The face becomes masklike. In the second stage of the disease the skin hardens and stiffens, particularly on the fingers, hands, and ankles, and the facial features become thinned. In the atrophic stage, ulceration is common on the finger tips, elbows, and ankles. Fibrosis of the lungs is a common sign.

The disease may start with Raynaudlike signs or with joint pains and stiffness. Both types may be intermingled. Difficulty in swallowing has been reported in only 16 patients, most of whom had had roentgen examinations, but only 1 patient had had an esophagoscopic examination, and no microscopic examination had been made during life.

This report is based upon the findings in the cases of 6 patients with diffuse scleroderma, all of whom had evidence of disturbed esophageal function.

In 1 early case no esophageal symptoms were elicited, but roentgen examination showed a complete loss of primary, secondary, and nearly all tertiary peristaltic waves. Four patients volunteered no complaints, but when questioned gave a history of esophageal disturbances. One patient had almost complete stenosis when first seen, and had experienced difficulty in swallowing as an initial complaint.

Early symptoms consisted of a feeling of fullness in the chest upon swallowing, which required a few moments to pass off, difficulty in swallowing any solids or even liquids when in the reclining position, and discomfort and pain behind the lower sternum when lying down, especially an hour or so after eating. The discomfort tended to increase gradually and difficulty in swallowing began to appear when the patient was in the upright position. Later only liquids could be swallowed, and the condition gradually progressed to complete stenosis. In the early stages the disturbance was demonstrable only by roentgen examination. Primary and secondary peristaltic waves disappeared completely, as did most tertiary waves. Because of gravity, liquid barium dropped rapidly with the patient in the upright position, but in the horizontal position it remained in the esophagus, which was diffusely dilated. In 3 cases there was stenosis at the upper border of the phrenic ampulla, about 4 cm. from the lower end of the esophagus. In 1, the stenosis was almost complete. Esophagoscopy showed a normal-appearing lining in the earliest case, but in 4 other cases a diffuse esophagitis was evident from the upper third of the esophagus down to the phrenic ampulla. The lower few centimeters showed a diffuse superficial ulceration with loss of surface epithelium, the area being covered with exudate. In 3 cases there was fibrotic stenosis at about 4 cm. above the cardiac opening. The phrenic ampulla appeared to be free from ulceration or stenosis.

Biopsy of tissue removed from 2 cases showed a granulating surface with changes in the submucous connective tissue resembling a sclerodermatic process.

MISCELLANEOUS

Thompson, S. A., and Birnbaum, G. L.: Asphyxial Resuscitation: The Phenomenon and Its Mechanism. *J. Thorac. Surg.*, 1943, 12: 624.

During an experimental investigation to evaluate various resuscitative methods, a phenomenon having a very definite bearing upon resuscitation was observed. It is designated as "the phenomenon of asphyxial resuscitation." It consists in the restoration of the circulation and respiration in advanced asphyxia without benefit of oxygen, resulting from of rhythmic inflation and suction deflation of the lungs with an inert or asphyxiating gas. Paradoxical as it may seem, it was possible to resuscitate an animal in the third stage of asphyxia by rhythmic inflation and deflation of the lung with the same inert gas, nitrogen or helium, which had just previously been used to produce the asphyxia. Resuscitation with an inert gas by the same method is also possible in asphyxia which has been produced by obstruction.

For the purpose of this study, asphyxia was divided into four stages: initial apnea; dyspnea; cessation of respiration, or terminal apnea; and arrest of the heart.

In evaluating resuscitation methods, it is necessary to consider the possibility of spontaneous resuscitation and the point at which it may occur in asphyxia.

It has been shown that asphyxial resuscitation with the use of an inert gas is possible far beyond the point in asphyxia at which spontaneous recovery could take place. Generally, the asphyxial resuscitation was started well beyond the forty-five-second point following respiratory cessation—the "critical point" at which the heart action becomes altered and irregular.

By the mechanical inflation and deflation of the lungs with a suck and blow resuscitator and an inert gas, two powerful reflex stimulants to the cardiovascular and respiratory centers are brought into play. It should be emphasized that the powerful reflex is not, and cannot be, stimulated by normal respiration, and asphyxial resuscitation is not to be recommended for clinical application when the use of oxygen is possible, since oxygen gives far superior results.

Various stages of asphyxia were produced in dogs by means of obstruction of the trachea or the inhalation of inert gases such as nitrogen or helium. It was found that if the asphyxiating procedure is not stopped within from twenty to thirty seconds after the cessation of respiration, spontaneous recovery does not occur. If, within a period of from forty-five seconds to two and one half minutes after cessation of respiration, suck-and-blow resuscitation with inert gas is applied, resuscitation of the circulation and respiration can be accomplished in 85 per cent of the cases.

The addition of 10 per cent carbon dioxide to the inert gas inhibited resuscitation by depression of the medullary center. Bilateral vagus section before asphyxia is started prevents resuscitation with inert gas.

It was concluded that asphyxial resuscitation is primarily a reflex phenomenon which is initiated most efficiently by the suck-and-blow resuscitator.

STEPHEN A. ZIEMAN, M.D.

Todd, G. S.: The Effect of Altitude on Cases of Pneumothorax. *Lancet*, Lond., 1943, 245: 597.

The factor of air transport before as well as following the outbreak of war has brought the problem of the effect of altitude on cases of pneumothorax to the foreground.

Because of this, the author thought it worthwhile to find out: (1) the optimum height for the transport of wounded with this condition, and (2) the height at which a pilot with artificial pneumothorax can safely undertake flying duties.

For this study a group of 4 cases of pneumothorax, 2 right-sided and 2 left-sided, were used. The following factors were studied: (1) clinical changes, (2) roentgenological changes, (3) electrocardiographic record, and (4) changes in the vital capacity and in the alveolar air at various heights. The rate of change of pressure within the chamber was approximately equal to that of 500 feet ascension per minute.

In case 1 no ill effects were noted until a height of 8,000 feet was reached, at which time there was a tight feeling within the chest. At 9,000 feet there was acute pain and a screen examination revealed a great pull on the mediastinum toward the opposite side from the pneumothorax.

In the second case the mediastinum was fixed. At 6,000 feet there was slight dyspnea, and at 8,000 feet acute pain occurred near the sternum at the level of the second rib in front. The veins at the neck were noticeably dilated. The mediastinum was markedly shifted, more so than in case 1.

Cases 3 and 4 presented left pneumothoraces. The rate of ascent was increased in these 2 cases but the results were similar to those in the first 2.

A fifth case, one of spontaneous pneumothorax with a bronchopleural fistula, was subjected to the altitude test. In spite of the presence of the fistula, symptoms similar to those noted in the first 4 cases were experienced, and the patient was not subjected to a negative pressure comparable to an altitude higher than 6,000 feet.

In view of these findings it would seem dangerous to fly cases of tension pneumothorax at any height until a needle has been put in position in the chest wall to allow the air under pressure to escape, and the needle should be left in place during the entire flight. If possible, no patient with a wound of the chest causing a pneumothorax should be taken to an altitude above 4,000 feet, and if higher altitudes are necessary some air should be removed from the pleural cavity of the patient before the start of the journey.

Individuals with a mobile mediastinum appeared to tolerate higher altitudes better than those with a stable mediastinum produced by adhesions.

WILLIAM E. ADAMS, M.D.

Norris, C. M.: Sulfonamides in Bronchial Secretion. *J. Am. M. Ass.*, 1943, 123: 667.

This report concerns an investigation of the value of sulfonamide therapy in the treatment of bronchiectasis. The distribution of sulfonamides among various body fluids has been investigated and reported by others.

The experiments of the author were made to determine the relationship between blood levels of sulfonamides and their concentration in bronchial secretions following oral administration of the drug. Also, the concentration of sulfonamides in bronchial secretions resulting from the intratracheal or intrabronchial instillation of the chemical was determined at twenty-four-hour intervals following the instillation.

Because the character of bronchial secretions presented a problem in chemical analysis, a special method for quantitative determination of sulfonamide concentration was devised. Only bronchoscopic specimens were submitted for analysis. Twelve patients with bronchiectasis were chosen

for treatment with sulfonamides by oral administration. The disease was of the saccular type in 8, and of the fusiform type in 4 of the patients. Sufficient sulfadiazine was given to maintain adequate blood levels. Bronchial secretions were obtained at from one to four-day intervals.

The results were as follows:

The concentration of sulfadiazine in the bronchial secretions ranged from 1.8 to 11.6 mgm. per 100 gm. with corresponding blood-sulfadiazine levels from 3.4 to 16.4 mgm. per 100 cc.

In 10 patients with acquired bronchiectasis, 12 instillations of a 5 per cent sulfathiazole solution and 6 instillations of a 2½ per cent aqueous solution of sulfadiazine were made. Some of the instillations were made through a bronchoscope while others were made through the larynx. Specimens were obtained at twenty-four-hour intervals. The results varied largely with the amount of sputum being produced at the time of instillation. In 2 instances appreciable amounts of sulfathiazole were found at the end of forty-eight hours, whereas in none of the cases following the instillation of sulfadiazine solution was a significant amount of this drug found at the end of twenty-four hours.

Sulfadiazine given orally to 10 patients for acquired bronchiectasis tended to decrease the daily sputum volume by as much as from 55 to 81 per cent. It was difficult to evaluate the effect of the chemical on the bacterial flora.

Further study and observation were thought necessary to confirm the impression that the results described were of value. The oral method of administration of the drugs was thought preferable because of the comfort and convenience to the patient, and because of the several disadvantages encountered in the use of the instillation method.

WILLIAM E. ADAMS, M.D.

Mulligan, R. M., and Lindskog, G. E.: The Morphology of Primary Carcinoma of the Human Lung. *J. Thorac. Surg.*, 1943, 12: 734.

A careful study of the pathological anatomy of 45 cases of primary carcinoma of the human lung from the autopsy files of the Colorado General Hospital, Denver, together with a review of about the same number of similar cases from the Chest Tumor Registry, has revealed the following findings:

Primary carcinoma of the lung was responsible for the death of 0.95 per cent of all persons subjected to autopsy during the period from October, 1924 to October, 1942. Instances of lung carcinoma were found in every decade except the first, but the greatest incidence occurred in the fifth and sixth decades.

The location of the primary lesions was of no diagnostic value in this series, but the classification used, which was based on histomorphology, is considered the simplest and most logical one. The origin of a few primary tumors of the lung from multicentric foci necessitates careful differentiation of these lesions from multiple pulmonary metastases arising from a primary site in some other organ. A correct decision in such cases would have an important bearing on the operability of this type of primary lung tumor. Metastases, which may be widespread, may fail to mimic the primary neoplasm. The metastases are tabulated in the order of frequency with which they involve other organs.

GEORGE A. COLLETT, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Stein, H. E., and Casten, D.: A Study of Recurrences Following Inguinal Hernioplasty. *Surgery*, 1943, 14: 819.

There is a great discrepancy in the reported results, and frequently an inadequate knowledge of the end-results of inguinal hernioplasty. Some of the causes of this discrepancy may be summarized as follows:

1. A large percentage of patients with recurrence do not consult the original operator. This is definitely shown by the fact that of the patients with recurrent hernias that present themselves at any hospital, almost 75 per cent have been primarily operated upon at another hospital.

2. The time elapsing between the time of operation and the follow-up is frequently too short. Examinations should continue for at least two years and probably longer. While most recurrences are observed within the first year after operation, the may appear after twenty years.

3. The patients have not been personally examined but have been permitted to report by mail, and it is well known that many patients have a recurrence without knowing it.

4. The percentages are occasionally calculated on the basis of the operations instead of on the number of cases re-examined at the follow-up clinic.

5. Many reports group hernias in children with those of adults. As recurrences in the former are very infrequent even after the simplest form of operation, inclusion of these age groups in the reports gives a much lower general percentage of recurrent rate.

The authors suggest the following method for ascertaining the true figures:

A clearing house should be set up and manned by some national organization such as the American College of Surgeons. A report of every recurrent hernia, whether operated on or not, should be sent to this clearing house which would then notify the hospital at which the primary operation had been done. This hospital in turn should send an abstract of the original findings back to the clearing house.

Recurrences are dependent upon one or several of the following factors: persistence of the original structural weakness or defect, inadequate operative procedure and technical errors, and increased intra-abdominal pressure after operation.

The recurrence may appear as an indirect hernia or a direct hernia as a result of one or more of the following contingencies: (a) the primary indirect hernia may have been completely cured, and the secondary hernia appear as a direct one; (b) the direct hernia may have been present but not noted at the first operation; (c) selection of the naturally weak route of Hesselbach's triangle for repair of a femoral hernia may have resulted in a subsequent direct inguinal hernia; or (d) cure of the direct hernia may have been difficult because of inadequate operative utilization of the natural defenses at this area.

A spigelian hernia may result. This is a hernia along the semilunar line. At this site there is an area of inherent weakness, covered only by the fascia of the internal oblique muscle, without any underlying muscular structure, and situated on a plane cephalad to that of the internal ring.

Prevention depends upon the adherence to certain principles. These are (1) elimination of the causes as far as possible; (2) re-establishment of the natural physiological and mechanical forces; (3) selection of the proper procedure; and (4) avoidance of technical errors in the course of the primary operation.

The essential features of the repair of indirect hernia are elimination of the sac, narrowing of the internal ring, formation of a flap of the internal oblique aponeurosis and its suture to Poupart's ligament, which will improve the trap-door action of the internal oblique muscle. There are 2 types of direct hernias: (1) those in which a distinct opening in the transversalis fascia and a fusiform sac are noted, and (2) those in which there is simply a bulge in the transversalis fascia and underlying peritoneum. In the former group, elimination of the sac by excision or infolding is necessary, and is to be followed by closure of the defect in the transversalis fascia; in the latter group, the transversalis fascia is incised medially to the curving free edge of the internal oblique muscle, and the cut edge of fascia thus formed is sutured to Poupart's ligament posterior to the line of suture between the internal oblique aponeurosis and Poupart's ligament. Unless the sac is very large, it is not necessary to open and excise it in this, the usual, type of direct hernia.

The technique of operation for the cure of recurrent hernia differs only in a few details from the procedure for the cure of the primary hernia. It is advisable to start the incision higher than the site of the previous operation so as to expose the external oblique aponeurosis cleanly, and follow down from this point. The possibility that the cord had been transplanted subcutaneously at the primary operation must be borne in mind and due care taken to avoid injury. Sharp dissection is preferable. The sac, especially of the indirect variety, usually being adherent to the surrounding tissues, is separated and dealt with. The internal oblique muscle will usually be found to be partially adherent to Poupart's ligament. This must be severed completely and restored to its former free state. Even if previous suppuration has destroyed a large part of the external aponeurosis, it is always possible and essential to expose the internal oblique aponeurosis, and from it

fashion the firm flap to be sutured to Poupart's ligament. If the internal ring is large it must be narrowed by taking a few mattress sutures and approximating its edges. In the earlier series, fascial strips were taken from the cut edge of the external oblique aponeurosis and fashioned as sutures according to the McArthur technique. In the later cases very fine silk or double zero chromic catgut have been used. Subaponeurotic transplantation of the cord has been done in most, but not all, cases, particularly in the direct hernias. CHARLES BARON, M.D.

GASTROINTESTINAL TRACT

Collins, V. P.: The Peptic Ulcer and Chronic Gastritis. *Ann. Surg.*, 1943, 118: 1005.

An attempt has been made to define the nature of "chronic gastritis" by an extensive gross and microscopic study of 213 surgically resected stomachs.

In a well developed callous peptic ulcer, all layers of the gastric wall are involved. However, less typical lesions are encountered which differ from the callous peptic ulcer only in degree, and may involve only certain layers of the gastric wall. Some may penetrate only partly through the muscularis, others only into the submucosa, and still others may be limited to the mucosa.

The least of these is the occurrence of scattered glands lined by epithelial cells which are undifferentiated into chief and parietal cells. There are other scattered glands undergoing a process of vacuolar degeneration which may progress to complete degeneration and leave only a vestige of the gland. From these tiny lesions a series of changes have been outlined which proceed by imperceptible stages from phenomena of degeneration and repair in the gastric mucosa, and, if they involve a number of adjacent glands, may lead to a microscopic focus of necrosis, through ulcerated and healed lesions limited to the submucosa or muscularis, and then to the overwhelming degeneration and necrosis with inadequate repair, which is recognized as a peptic ulcer.

This uninterrupted series of lesions, which is concerned primarily only with the epithelial elements of the gastric gland, is proposed as the basis of "chronic gastritis." This condition does not precede or become associated with peptic ulcer, but includes it. There is some evidence to indicate the presence of a similar process in the duodenal mucosa but the surgical material has been inadequate for an extensive study of this aspect.

When foci of degeneration occur and recur in great numbers, a prolonged proliferative repair process is called forth and exhaustion of the germinal epithelium may occur. This is evidenced by atrophy and disappearance of the glands, and diminution in mucous secretion, or by metaplasia of the epithelium of surface and gastric pits, which produces the so-called atrophic gastritis. Hypertrophic gastritis was found to be a mechanical alteration in the gastric mucosa due to submucosal edema and associated changes.

Thus, chronic gastritis is considered to represent a pathological process stemming from the normal degeneration and repair of gastric glands.

EDWARD W. GIBBS, M.D.

Horsley, J. S.: Three Successful Cases of Total Gastrectomy. *Virginia M. Month.*, 1943, 70: 549.

Until a few years ago total gastrectomy was an extremely rare operation, and even now it is uncommon. In 1929 Waltman Walters reported a successful total gastrectomy in the Proceedings of the Staff Meetings of the Mayo Clinic, and said that including his own case there were only 70 cases recorded in the literature. Felix de Amesti in a paper published in 1943 stated that about 240 total gastrectomies had been recorded in the literature of the world.

The two chief reasons for the rarity of this operation have been the high operative mortality and the opinion that the hemopoietic process was adversely affected by removing all of the stomach.

Experimental work by Mann, Ivy, Dragstedt, and others has demonstrated that it is impossible to produce pernicious anemia in laboratory animals by total gastrectomy. In an excellent paper on total gastrectomy by Farris, Ransom, and Coller, careful observations are recorded on 4 patients who survived total gastrectomy for more than two years. One patient at that time was living and in good health four years and seven months after operation. These authors state that the anemia resulting from total gastrectomy is distinctly hypochromic microcytic or secondary anemia, which is usually associated with iron deficiency. According to these writers, the administration of ferrous sulfate three times a day for one week of every month prevents this secondary anemia. After a few months the patient is able to take practically any kind of food, but in smaller quantities and at more frequent intervals.

The author has performed 15 total gastrectomies. The first was done in 1929, the same year that Walters reported 70 cases then in the literature. His twelfth case was operated upon on March 11, 1942. All of the 12 patients died following the operation. All operations were for extensive cancer except one, which was for multiple ulcers, one being a large perforating ulcer in the cardiac portion of the stomach. Two of the deaths were from pneumonia, 1 was from shock, 1 from volvulus of the bowel between the enteroenterostomy and the esophagus, and 1 from thrombosis of the superior mesenteric vessels. The other deaths were from infection, subdiaphragmatic abscess, or general peritonitis. In 4 patients the sepsis resulted from a leak at the suture line; in the others, sepsis apparently developed independently of a leak. Several of these cases, especially the earlier ones, presented very extensive carcinoma and should not have been operated upon, as postmortem examinations disclosed residual carcinomatous tissue in the pancreas or in the region of the gastrectomy. In all of the cases except one—with death from shock—a post-mortem examination was made.

During this year the author has performed 3 total gastrectomies, and all of the patients have made satisfactory operative recoveries.

There have been numerous additions to the technique of total gastrectomy. Charles Bruce Morton has given a very clear description of the technique that he has employed successfully. Lahey has shown that the spleen can be removed with apparently no deleterious effect upon the outcome of the total gastrectomy. Allen made an important contribution in suturing the loop of the jejunum to the diaphragm in order to prevent traction upon the sutures to the esophagus. Probably one of the most important recent contributions to the technique is that of Roscoe Graham who advocates severing the vagus nerves, bringing down the esophagus by blunt dissection with the finger, and suturing a loop of jejunum parallel to the terminal esophagus. A transverse incision is made in the jejunum about 1 in. below the suture line, and the esophagus is then divided and the end of the esophagus is implanted into the incision in the jejunum. This makes a buffer behind the esophagus which would seem to forestall leakage at this point.

The technique the author employed in his 3 successful cases was a combination of different features that have been developed by others and the result of observations in the autopsies of his patients who died. Since the death of the jejunal loop due to volvulus, the afferent limb of the loop of jejunum is united to the stump of the duodenum. This not only makes a three-point fixation of the jejunal loop and prevents volvulus, but offers an easy exit for the duodenal contents.

The suggestion by George Grey Turner of severing the bloodless coronary ligament of the left lobe of the liver and packing off the left lobe toward the right side offers a much better field for the esophageal opening.

The important improvements in this technique, aside from the general preparation of the patient and the selection of the cases for operation, are the adoption of the principle of the Roscoe Graham method of making the esophagojejunal union and the insertion of a large rubber tube with a ¼" lumen in the anastomosis which permits the telescoping of the esophagus into the jejunum without occlusion of its lumen. Union of the right limb of the loop of the jejunum with the stump of the duodenum, aseptic enteroenterostomy with rubber bands, the enterostomy in the efferent loop of the jejunum, and the use of sulfanilamide and sulfathiazole in the peritoneal cavity are also important.

JOHN E. KIRKPATRICK, M.D.

Gibbs, E. W., and Sutton, P. W.: Intussusception; 92 Cases in Infancy and Childhood. *Surgery*, 1943, 14: 708.

Acute intestinal intussusception is one of the most important surgical emergencies in the early years of life. An admirable discussion of the subject has been presented by Ladd and Gross recently. Their remarkable decrease in mortality for this frequently fatal disease stimulates a review of additional cases from other clinics and hospitals in an effort to achieve a universal reduction in mortality.

The cases have been reviewed from two institutions which are affiliated with the University of Cincinnati and are supplied by the same rotating surgical house staff, the Children's Hospital of Cincinnati and the Cincinnati General Hospital. The records of the former include both private and ward patients under fifteen years of age. Those of the latter represent only ward patients in the same age group.

The review covers a sixteen-year period from January 1, 1927 to December 31, 1942. During this time 59 patients with 60 intussusceptions were operated upon in the Children's Hospital and 31 patients with 32 intussusceptions were operated upon in the General Hospital.

It is well known that intussusception is particularly apt to occur in well nourished, healthy infants and children. The cases proved this statement to be true in the majority of instances. Early in the illness the child may not appear to be very ill, especially if seen between the paroxysmal attacks. However, if intestinal obstruction remains present for many hours the child becomes obviously ill. Although the classical triad of symptoms—pain, vomiting, and hematochezia—was reported in less than one-half of the cases, two of the three cardinal symptoms were noted in more than 90 per cent.

In the authors' opinion every case of intussusception is a surgical emergency and the patient should be operated upon as soon as the diagnosis is made. They have had no experience with nonoperative methods of reduction. They have noted the excellent results obtained by Hipsley with preliminary injections of saline solution per rectum prior to operation.

If the child is dehydrated, toxic, or acidotic, fluid and electrolyte balance are restored rapidly by the intravenous or subcutaneous administration of fluids. This and blood or plasma transfusions may be continued during operation if the child's condition warrants. Atropine or scopolamine is given by hypodermic injection in proper preanesthetic dosage.

Open drop ether anesthesia is preferred to local anesthesia unless it is specifically contraindicated. Not only does local anesthesia produce poorer relaxation and greater technical difficulty but it also renders the operation more shocking to these frequently tiny patients.

All of the cases in this review were operated upon. A right rectus incision was used in 80 cases. A left rectus, a midline, and a McBurney incision were used in 3 cases. In 3 other cases the type of incision was not recorded.

Reduction of the intussusception is performed by gentle pressure backward along the intussuscipiens in an attempt to squeeze out the intussusceptum. Traction should be used only with great care. Small tears in the serosa are not particularly serious and should be repaired immediately, but perforation dur-

ing reduction is a grave and sometimes fatal technical error, even though it is recognized and repaired.

Once reduced, the bowel may appear very dusky or angry red because of edema and hemorrhage. A few moments spent in observation after the application of warm saline pads will give evidence of viability by improvement in the color and the return of peristalis.

Most surgeons are agreed that bowel resection should never be done unless absolutely necessary. The mortality of resection in infants is estimated at from 70 to 100 per cent.

In the authors' opinion, the procedure to be used must be chosen for the individual case. The operator must make every effort to reduce the lesion, even though it may require one-half hour, rather than to resort to unnecessary resection. On the other hand, valuable time must not be wasted in attempting to reduce an irreducible or gangrenous lesion. If resection is necessary and the patient's condition will permit, primary anastomosis is preferred. On the other hand, the Mikulicz procedure can be more rapidly executed and its use, when the patient's condition is critical, may mean the difference between a live child with an enterostomy and a dead one with an anastomosis. However, infants and young children do not very well tolerate the subsequent loss of succus entericus and every effort must be made to maintain their fluid, protein, and electrolyte balance. Restoration of bowel continuity should be established as soon as feasible.

At the Children's Hospital 60 operations were followed by 18 deaths, a mortality of 30.0 per cent. At the General Hospital 32 operations were associated with 10 deaths, a mortality of 31.3 per cent. The average mortality for the entire series from both institutions for the sixteen-year period was 30.4 per cent.

There was a conspicuous decrease in mortality among the cases herein reported during the last five years. Since 1937, 22 patients were operated upon at the Children's Hospital with 1 death, a mortality of 4.5 per cent; and 14 were operated upon at the General Hospital with 2 deaths, a mortality of 14.3 per cent. The combined mortality for both institutions during this period was 8.3 per cent.

Similar improvement in recent years has been obtained by others. Gordon reported 16 consecutive cases with a 6.25 per cent mortality. Ladd and Gross reported a mortality of 14.0 per cent in 90 cases and in their recent article they report 12 consecutive cases without a death.

The three most important factors in the lower mortality figures for the last five-year period are probably: (1) earlier hospitalization and fewer cases of delayed operation, (2) fewer bowel resections, and (3) improved preoperative and postoperative care.

This report again indicates the dangers of delayed operation for intussusception. Only 19 per cent of the patients in the last five-year period had allowed symptoms to progress for more than forty-eight hours before coming to operation, while 44 per cent of those seen in earlier years were operated upon after the second day of illness. Not only was the average duration of symptoms on admission less in the recent group (35.8 hours as compared with 45.3 hours for the earlier cases), but there was also less delay between admission and operation (3.9 hours as compared with 7.8 hours).

Twenty-three of the 28 deaths occurred during the first twenty-four postoperative hours and the authors have come to believe that if a patient survives the first twenty-four hours after operation he is apt to recover. These early deaths are generally attributed to shock and toxemia.

In conclusion, 92 cases of intussusception in which the patients were operated upon in infancy and childhood were reviewed. The classical syndrome was described in less than one-half of the cases. Of every 10 cases, pain was present in 7, vomiting in 9, and hematochezia in 7. At least two of these symptoms were noted in nearly all of the cases. A palpable abdominal mass was described in 6, and a rectal mass in 4 of every 10 cases.

A lower mortality will be obtained only when the pediatricians are constantly on the alert for cases of intussusception, and by prompt hospitalization and operation, by careful and individual selection of the operative procedure, and by intelligent co-operation between the pediatricians and surgeons before and after operation. JOHN E. KIRKPATRICK, M.D.

Duncan, P. A., Wearn, F. S., Jackson, H. F., and Waldron, W. S.: Successful Surgical Treatment of Multiple Atresias (Aplasias) of the Small Intestine in a Premature Infant. *J. Am. M. Ass.*, 1943, 123: 764.

Multiple atresias (aplasias) of the small intestine of a premature infant were given surgical treatment

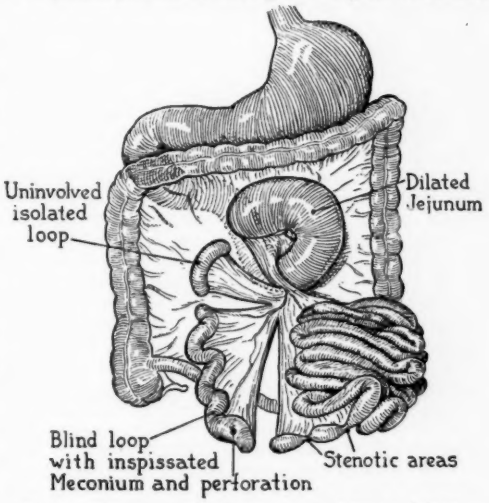


Fig. 1. Diagrammatic sketch of the abdominal findings at the time of operation.

successfully. A small isolated loop of jejunum was resected. This loop contained a perforation caused by inspissated meconium. The proximal end of the distal small intestine, containing two areas of stenosis, was resected because its mesentery was torn during the operative procedure. A side-to-side anastomosis was made between the distal intestinal stump and the proximal dilated jejunum. A prolonged period of biliary obstruction and two episodes of severe diarrhea complicated the postoperative course. J. M. MORA, M.D.

Howard, J. W.: Carcinoma of the Duodenum. *Am. J. M. Sc.*, 1943, 206: 735.

From a review of the literature, the incidence of carcinoma of the duodenum was as follows:

Fifty-five cases of carcinoma of the duodenum were recorded in 117,433 autopsies, an incidence of 0.047 per cent. In 1.47 per cent of 10,340 cases of carcinoma of the intestine, the lesion was primary in the small intestine. In 37 per cent of 163 cases of primary carcinoma of the small intestine, the site of the lesion was in the duodenum, in 35 per cent it was in the jejunum, and in 28 per cent it was in the ileum. Of the duodenal carcinomas, 34 per cent were in the first or preampullary portion, 45 per cent were in the second or periampullary portion, and 21 per cent were in the third or prejejunal portion.

The etiology of carcinoma of the duodenum remains obscure, but these lesions probably do not arise from pre-existing ulcers and they are seldom associated with polyposis. The author agrees with those who contend that the rarity of the lesion may be due in part to the location of the duodenum and the nature of its contents.

Carcinomas of the duodenum usually occur as single lesions, either stenosing or polypoid in character, more often the former. Most of the available evidence indicates that these tumors metastasize late and that they involve chiefly the regional lymph nodes and less often the mesentery, liver, lungs, peritoneum, supraclavicular nodes, and bone.

Carcinoma of the duodenum occurs 3 times more often in males than in females. The average age of the patients falls in the sixth decade. The diagnosis is a difficult one and early symptoms usually are of a vague gastric nature. There may be anemia, either macrocytic and hyperchromatic or microcytic and hypochromatic. Occult blood in the stools is frequent. Complications of obstruction, dehydration, toxemia, perforation, and erosion of blood vessels may occur. X-ray studies are not uniformly diagnostic.

Three cases of carcinoma of the duodenum are reported, one associated with erosion of the superior mesenteric artery. EDWARD W. GIBBS, M.D.

Fawcett, D. W., and Gens, J. P.: Magnesium Poisoning Following an Enema of Epsom-Salt Solution. *J. Am. M. Ass.*, 1943, 123: 1028.

The authors report 2 cases of magnesium poisoning, one of which terminated fatally.

The first case was that of a two-year-old boy who had been given an enema containing epsom-salt solution two months after an abdominoperineal plastic operation for imperforate anus. The enema was expelled with good results. Almost immediately thereafter flaccid paralysis, coma, and respiratory arrest occurred, and the child died a few hours later of respiratory arrest, in spite of vigorous supportive therapy. Autopsy failed to reveal the cause of death.

The second case was that of a twenty-three-year-old woman with a left ureteral calculus, which was confirmed by x-ray examination. In preparation for intravenous pyelography she was given an enema containing 40 cc. each of saturated solution of magnesium sulfate, glycerine, and water. The full enema was retained for only two minutes, but fairly satisfactory results were obtained. Thirty minutes later she complained of feeling hot all over, and thirsty. Forty-five minutes after that she was found to be unresponsive. There was complete flaccid paralysis with absent reflexes and rapidly developing coma. Because of the experience with the first case, magnesium poisoning was suspected and the patient was given calcium gluconate intravenously, following which she made a rapid recovery. A serum-magnesium determination of 20.8 mgm. per 100 cc., was made before complete recovery and about three hours after the enema. From a urine analysis, it was calculated that she had excreted about 196 mgm. of magnesium in a period of three hours following the enema.

The authors believe that some patients possess intestines which are peculiarly permeable to magnesium salts. If the signs of impending toxic effects, namely, severe thirst and hot flashes, are recognized in a patient who has been given magnesium in any form, the prompt administration of calcium may be a lifesaving procedure. EDWARD W. GIBBS, M.D.

Singleton, A. O.: One-Stage Perineoabdominal Operation for Cancer of the Rectum. *Surgery*, 1943, 14: 691.

The author has used the reverse or perineoabdominal sequence of resection of the rectum in 46 consecutive patients with cancer of the rectum. There were 2 deaths early in the series but no deaths among the last 39 consecutive cases. Long preoperative preparation is not considered necessary. A purgative is given forty-eight hours before, and an enema is given the night before operation. Gastric suction is started before anesthesia begins and is continued for from three to four days following the operation. For the first or perineal part of the procedure the extreme lithotomy position is used and an indwelling catheter is placed in the bladder. One yard of gauze is passed into the rectum and the anus is closed with a double row of purse-string sutures. Incision is made in the usual way and the rectum is freed up to the sigmoid. In women the posterior vaginal wall is usually removed with the rectum. A sterile glove is tied securely over the anal and rectal portion of the

bowel and the freed mass is pushed into the peritoneal cavity.

Suturing of the peritoneum is started at the bladder and continued for a short distance when the needle and suture are wrapped with gauze and pushed into the abdominal cavity. The perineal space is filled with a large iodoform pack wrapped with rubber tissue or cellophane and the wound is closed around the protruding portion of the drain. Dressings are applied and the patient is placed straight upon the table in the Trendelenburg position for the laparotomy.

After a change of gloves, gowns, and operative tray a midline incision is made. The glove-covered rectum is brought out of the abdomen and liberated completely to the sigmoid flexure. The suturing of the peritoneum, previously started, is completed. For a midline colostomy, which is usually made, the wound is closed about the rectum and the doubly-clamped bowel is removed distal to the skin with the electric cautery. Thus the bowel has not been entered at any time until the operation is completed, and then outside of the abdomen. The clamp is left on the colon for from thirty-six to forty-eight hours. The various steps are illustrated by drawings.

Criticisms of the operation are: (1) an opportunity is not afforded for examination of the liver and lymph glands before the operation is completed; (2) cleansing of the colon before operation is difficult without a previous colostomy; and (3) troublesome ileus may occur following operation because the colostomy has not developed proper function with a previous colostomy before the removal of a large amount of the bowel.

The author makes criticisms and answers them as follows: (1) liver metastasis is not a contraindication to resection of the rectum since the patient will live longer and more comfortably after resection; (2) in this procedure the bowel is not opened until the operation is finished so that a perfectly dry and empty bowel is not essential; and (3) routine gastric suction has completely eliminated dangers from ileus and distention.

Advantages of the operation over the abdominoperineal method are that it is easier and more rapid of performance; it requires less time in the abdomen and shock is lessened; and the chances of infection are reduced. JOHN L. LINDQUIST, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Jenkins, H. B.: Spontaneous Hepaticogastric Biliary Fistula. *J. Am. M. Ass.*, 1943, 123: 830.

The author reports a case of spontaneous hepaticogastric biliary fistula. He states that he was unable to find a similar case reported in the literature. However, 2 cases of hepaticoduodenal fistula had been reported. Spontaneous internal biliary fistulas from any origin terminating in the stomach are rare.

The author's patient was a white male twenty-six years of age who had had an appendectomy three years prior to his present illness. His present illness began with dull pain in the epigastrium which shifted to the right side of the abdomen, to the region between the gall bladder and the appendix. There was no radiation of the pain to the back, shoulder, or groin. The patient suffered from nausea and anorexia, but there was no vomiting or diarrhea. The temperature was 100.4°F. and the pulse rate 100. The leucocyte count was 18,600 with only 65 per cent polymorphonuclear cells, but 5 per cent of the cells were eosinophils. He developed symptoms of generalized peritoneal irritation and an exploratory operation was performed. A ruptured gangrenous gall bladder was found. Gall stones were found in the gall bladder as well as in the peritoneal cavity.

Fig. 1. Hepaticogastric fistula, stones in hepatic and common ducts; fibrous degeneration of cystic and common ducts and distal portion of hepatic duct; and perforated gall bladder impacted with stones.

The gall bladder was opened and the stones were removed. Then the gall bladder was removed, and the cystic and common ducts were identified as solid fibrous cords. One large stone which was embedded in a fibrous cord representing the remains of the distal portion of the hepatic duct just proximal to the cystic duct, and another large stone which was embedded in the fibrous cord representing the remains of the common duct just distal to the cystic duct were removed. The proximal portion of the hepatic duct was widely dilated and joined to the anterior wall of the stomach near its lesser curvature and 6 cm. proximal to the pylorus. The fistulous tract was explored and found to have an opening into the stomach about 1.5 cm. in diameter.

The patient made a satisfactory recovery, and careful questioning of the patient and of his family failed to reveal a history of jaundice at any time.

EARL O. LATIMER, M.D.

Park, H.: Successful Repair of a Common Hepatic Duct Completely Severed by a Fragment of High Explosive. *Brit. J. Surg.*, 1943, 31: 198.

The author reports the case of a rare lesion—a gunshot wound of the abdomen causing a complete severance of the common hepatic duct, which was followed by recovery after end-to-end anastomosis of the duct.

A twenty-one-year-old male sustained a penetrating wound of the abdomen together with a compound fracture of the right elbow during naval action. About nineteen hours after the injury the author explored the abdomen through a left paramedian incision, incorporating the entrance wound in the incision. The abdominal cavity contained a considerable amount of blood. There was no evidence of gastrointestinal contents. The blood was noted to contain bile. A fine piece of shrapnel was removed from the gastrohepatic omentum and the common duct was found to be completely severed. The proximal end of the severed duct could not be found, having retracted into the porta hepatis. A drainage tube was sutured to the tissues in the region of the duct.

The drainage tube was retained for three weeks, during which time about 500 cc. of bile drained daily. The patient was given bile salts. The stool was soon of normal color. During the third week there was an attack of cholangitis accompanied by fever, chills, and jaundice, with clay-colored stools and bile in the urine. From that time on the conjunctiva had an icteric tinge. Bile drainage stopped once for twelve hours and once for seventy-two hours. Bile drainage gradually diminished and ceased entirely eleven weeks after the injury, and gradually deepening jaundice ensued.

The abdomen was opened through a subcostal incision. Dense adhesions were encountered. A pseudocyst, containing about 350 cc. of white bile, was on the under surface of the liver, medial to the collapsed, empty, and atrophic gall bladder. The proximal end of the common hepatic duct was identified. The distal end was found by tracing the cystic duct. A fine bougie was passed through the distal segment into the duodenum. The author was unable to anastomose the duct over a T-tube; therefore the anastomosis was made without the use of a tube and the abdomen was closed with drainage.

There was drainage of white bile for a week and decreasing amounts of normal bile drained for three weeks more. The jaundice disappeared, the patient put on weight, and his blood picture became normal. He left the hospital three months after the reconstructive operation. EARL O. LATIMER, M.D.

Gottesman, J., Casten, D., and Beller, A. J.: Changes in the Electrocardiogram Induced by Acute Pancreatitis. *J. Am. M. Ass.*, 1943, 123: 892.

The differential diagnosis of acute pancreatitis from acute coronary occlusion and perforated peptic ulcer presents many difficulties. A series of changes were observed in the electrocardiographic patterns in 6 cases of acute pancreatitis. Routine electrocardiographic studies were carried out on patients with acute abdominal complaints, and the diagnosis of acute pancreatitis was confirmed by the clinical cures, and at operation or autopsy.

Six cases are reported in detail. Four patients were males of thirty-eight, thirty-eight, fifty-three, and sixty-three years of age respectively, and 2 were females of fifty and sixty-eight years, respectively. All patients complained of acute upper abdominal pain. The electrocardiographic changes were significant in all cases, and operation was performed on 1 patient. The blood amylase was significantly increased in 3 of 4 patients. Three patients died and 3 survived the acute pancreatitis. There was no evidence of any pathological condition of the heart in either the patients who died or in those who recovered.

In an attempt to determine whether these changes could be duplicated, a series of experiments was carried out on dogs. Preoperative electrocardiograms were taken, after which a sterile solution of sodium taurocholate was injected into the accessory pancreatic duct. Acute pancreatitis was induced, and all of the dogs developed acute hemorrhagic pancreatitis. Electrocardiograms were taken immediately after injection of the solution and at intervals of from twelve to twenty-four hours, until the animals died. Five dogs were operated upon in this manner. Control electrocardiograms were taken of other dogs. In all of the dogs in which pancreatitis was produced, significant changes in the electrocardiographic tracings were observed. The changes were inconstant in pattern but were usually interpreted as suggesting myocardial damage. There was never gross or microscopic evidence of myocardial damage or infarction in any of the dogs.

The authors mention 3 symptoms which should help in the differential diagnosis of cases in which changes are produced in the electrocardiogram by acute pancreatitis. They are: (1) elevated blood amylase, (2) signs of peritoneal irritation in the upper part of the abdomen, and (3) variations in the electrocardiographic tracing which may simulate coronary disease or myocardial infarction. The electrocardiographic studies were made on patients in clinical shock after extensive surgical procedures for perforated peptic ulcer and intestinal obstruction, and in none of these patients was the electrocardiogram interpreted as abnormal.

RICHARD J. BENNETT, Jr., M.D.

Pasternack, J. G.: Calcareous Pancreatitis; Report of 3 Cases with Autopsies. *Ann. Int. M.*, 1943, 19: 757.

The author reports 3 cases of calcareous pancreatitis, all of which were found at autopsy. The cause of stones in the ducts and calcareous changes in the parenchyma of the pancreas is not definitely known. Infection by way of the ducts, regurgitation from the biliary tract, and stasis of pancreatic secretions are probably important contributing factors to the formation of duct stones. Calcification of the parenchyma is probably also a sequel of infection. In patients with pancreaticolithiasis, there is frequently a history of obscure attacks of abdominal pain and of episodes of vague gastrointestinal disturbances which may well represent subclinical or abortive attacks of acute pancreatic necrosis. Once formed, a focus or

foci of calcification continue to grow by further addition of calcium salts. In one of the author's cases, x-ray evidence of the pancreatic concretions was absent two and one-half years before the lesion was found at autopsy.

The concretions may consist of sandy or gravel deposits free in the ducts or incrusted over their wall. The larger stones are usually found in the head near the duodenal orifice of the pancreatic ducts. Usually, parenchymal calcification consists of crumbly chalky gravel in large or small collections. The consequences of calculi and calcareous deposits are atrophy and progressive fibrosis with a variable degree of destruction of the parenchyma of the gland. The acinar tissue is affected first and most markedly. The islets of Langerhans are not significantly involved until the disease is far advanced. Diabetes occurs when enough of the islets are destroyed. However, even when there are advanced lesions there may be few or no symptoms.

Signs and symptoms of pancreatic insufficiency are present in about half of all cases of calcareous pancreatitis. Frequent bulky pale stools, marked inanition, and extreme asthenia are the most characteristic clinical manifestations. The diagnosis when suspected is verified by x-ray demonstration of calcareous deposits in the region of the pancreas.

EARL O. LATIMER, M.D.

Snoke, P. O.: A Solitary Calcified Cyst of the Spleen. *Am. J. M. Sc.*, 1943, 206: 726.

Two clinical entities should be thought of when the radiologist encounters a large annular calcification in the left upper abdomen. The first is a solitary calcified cyst of the spleen, the second, an aneurysm of the splenic artery. Solitary cysts of the spleen are not exceedingly rare but calcified cysts are rare; at least 90 cases of aneurysm of the splenic artery have been reported.

The roentgen-ray appearance of calcified aneurysm of the splenic artery and of calcified cyst of the spleen

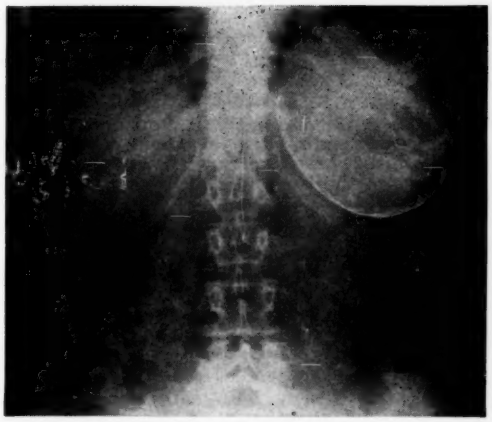


Fig. 1. Large annular calcified shadow in left upper quadrant. Preliminary film of abdomen.

is the same. There is one distinguishing clinical feature and that is bruit in the case of aneurysm. There may or may not be pulsation in the case of aneurysm. Since surgery of an aneurysm is hazardous and results in a high mortality, while the removal of a splenic cyst is considerably less dangerous, the surgeon should make a definite diagnosis before operation is attempted.

The author reports an instance of calcified cyst of the spleen in a sixty-year-old female. The calcification occurred within three years for earlier films of the upper abdomen did not reveal its presence. The spleen and an accessory spleen were removed and the patient made an uneventful recovery. The gross and microscopic examination of the spleen confirmed the preoperative diagnosis.

The author was able to find only 5 similar cases reported in the literature. EARL O. LATIMER, M.D.

GYNECOLOGY

UTERUS

Scheffey, L. C., Thudium, W. J., and Farell, D. M.: Further Experience in the Management and Treatment of Carcinoma of the Fundus of the Uterus, with Five-Year End-Results in 75 Patients. *Am. J. Obst.*, 1943, 46: 786.

A consecutive series of 127 patients having carcinoma of the fundus has been studied with respect to diagnosis, management, and treatment. Of this group, 75 are eligible for a comparative analysis of five-year end-results. There are no untraced patients.

Four of 5 women had already passed their menopause when the diagnosis was made and treatment was instituted. The average age of patients in this group was fifty-eight and nine-tenths years, and the condition was suspected correctly in 90 per cent of the patients because of the postmenopausal bleeding alone.

In the menopausal group (21.3 per cent), the average age was forty-six and three-tenths years, and in 10 per cent of these carcinoma was not suspected. It is among these younger women, who have not ceased menstruating, that irregular bleeding is too often regarded as benign in origin, and ill-advised or inadequate treatment is administered. In this regard may be mentioned indiscriminate hormonal therapy, instituted before organic disease has been eliminated, or employed when more radical methods would, in truth, be conservative and life-saving. Abnormal uterine bleeding, then, was the most significant and reliable symptom in 96 per cent of the entire series of cases.

The value of diagnostic curettage is apparent, for omission of the procedure was especially costly in certain instances. No known ill results followed its use.

Fibromyomas were noted in approximately 38 per cent of all patients treated surgically, and in a number of irradiated patients their presence was suggested on palpation. Previous pelvic operative procedures had occurred in nearly 30 per cent of all the patients.

Carcinoma was thought to be limited to the uterus in 74 per cent of the patients when they were first seen, irrespective of the size of the uterus.

It is not a simple matter to establish a decisive gradation of malignancy in every case. Not infrequently the picture is a varied one. For this reason the authors have chosen the broad and somewhat simplified classification that has been described. No absolute conclusions can be drawn with regard to the relationship of the grade of malignancy to the type of treatment, but the clinical evidence in this series confirms, in several respects, the observations of others. Low-grade lesions respond equally well to irradiation and surgery, but it would seem that the survival rate in intermediate and high-grade lesions is materially improved in cases in which irradiation has been a factor in the treatment, either singly or in combination with surgery. Prognosis based on the grade of malignancy alone is uncertain; it is only one of various factors that must be considered. With irradiation therapy, it is the clinical response of the lesion that counts most of all.

The various methods of treatment used by the authors have been described in detail, and the relative five-year survivals are presented as follows: (a) surgery alone, 18.1 per cent; (b) irradiation alone, 40.5 per cent; (c) surgery and irradiation, 38.4 per cent (corrected for uteri actually removed, 42.9 per cent). Irrespective of the type of treatment employed, the five-year end-results are 38.6 per cent absolute and 39.1 per cent relative.

A careful analysis of their earlier experience, combined with the encouraging response to the more recent and systematic plan of procedure described, has convinced the authors that preliminary irradiation with radium, followed by complete operation from eight to ten weeks later, is the treatment of choice in carcinoma of the fundus. The procedure employed, and the reasons for its use, together with certain exceptions and contraindications that may prevail, have been discussed in detail.

EDWARD L. CORNELL, M.D.

EXTERNAL GENITALIA

Pommerenke, W. T., and Hahn, P. F.: Absorption of Radioactive Sodium Instilled into the Vagina. *Am. J. Obst.*, 1943, 46: 853.

The use of radioactive sodium provides a delicate method whereby the transportation of this substance throughout the body may be accurately followed.

Radioactive sodium readily passes into the general circulation following its installation into a traumatized vagina. Absorption from the intact vagina and/or cervix is less marked.

These experiments suggest the need for special caution in administering douches containing poisonous ingredients, particularly when the vagina and/or cervix has been recently traumatized.

EDWARD L. CORNELL, M.D.

MISCELLANEOUS

Phaneuf, L. E., Heffernan, R. J., and Kasdon, S. C.: Functional Urinary Incontinence in Women. *N. England J. M.*, 1943, 229: 743.

The purpose of this article is to evaluate the Kennedy operative procedure for the relief of stress incontinence, which is defined by the authors as "functional incontinence in which the sphincteric action of the bladder neck and urethra has been impaired by childbirth."

The literature on urinary incontinence is briefly reviewed with the conclusion that the best promise

of satisfactory treatment has come from the recent work of Kennedy. The most frequent causes of this type of urinary incontinence are: (1) trauma to the sphincters in the inner and middle thirds of the urethra, which become partially fixed by fine bands to the posterior lateral margins of the adjacent pubic rami, and (2) damage in the midline to those voluntary fibers that pass under the middle third of the urethra and are attached to each ramus of the pubis posteriorly to make a sling support.

The technique of Kennedy's procedure consists of freeing the urethra and replacing the sling support. This is done by first dissecting the anterior vaginal wall from the urethra, and then dissecting the urethra from the pubic ramus on each side. Next, 3 rows of interrupted sutures are placed over the urethra, these sutures pulling together the tissues immediately under the urethra; a second row of sutures approximates the fascialike structures on each side of the urethra. The purpose of these 2 rows of sutures is to keep the urethra away from the pubic rami. Finally, the approximating third row of sutures is put through the anterior vaginal wall which reconstructs the posterior sling and affords support.

The follow-up of these patients for an average period of seventeen months showed: complete late recovery of bladder function in 18, or 78 per cent, of the cases; marked improvement in 3, or 13 per cent; and failure in 2, or 9 per cent of the cases.

SAMUEL J. FOGELSON, M.D.

Randall, J. H., and Odell, L. D.: Primary Dysmenorrhea. *J. Am. M. Ass.*, 1943, 123: 735.

It is now generally agreed that there is no consistent anatomic lesion in patients suffering from primary dysmenorrhea, and that earlier investigators have erred in attributing the case directly or indirectly to some obvious or obscure anatomic finding, such as a retroverted, anteflexed, or infantile uterus; cystic ovaries; presacral neuritis; defective uterine musculature; or disturbed innervation. The presence of anatomic defects is apparently incidental, and primary dysmenorrhea must be explained on some other basis.

The pain experienced in primary dysmenorrhea is evidently due to uterine contractions. This point of view is confirmed by the experimental work of Moir, Kurzrok, and Bickers, who noted that maximum discomfort is experienced during the first two days of the menstrual period at the time of the strongest luteal contractions. Clinically, one can reproduce the typical cramplike pains of primary dysmenorrhea by inserting a sound within the uterus. Women have also noticed the similarity of these pains to labor pains and after-pains.

Kurzrok first observed that ovulation is a necessary precursor to painful menses. The presence of secretory endometrium, ascertained by suction biopsy), in the authors' patients, and the similar report of Sturgis and his coworkers support this position. It is also true that the suppression of ovulation by diethylstilbestrol, or other estrogens, prevents the development of secretory endometrium and results in painless menstruation in patients with primary dysmenorrhea.

It is an old clinical observation that primary dysmenorrhea is often completely or partially relieved by childbearing. It is believed that this is due to freer egress of the menstrual discharge into the vagina through the parous cervix. The accumulation of menstrual fluid within the uterine cavity stimulates "luteal" contractions until the threshold is reached and pain results. Instrumental dilatation of the cervix cannot produce any permanent enlargement of the cervical canal.

Physicians err in treating primary dysmenorrhea on the principle that it is caused by organic disease or endocrine deficiency. The emphasis on organic or functional defects creates a poor mental attitude. The first objective in treatment should be to assure the patient that she is absolutely normal and to explain in simple terms the basic physiology of menstrual distress. The second thereapeutic objective is the relief of pain. Usually this can be done with simple analgesics, particularly after the patient realizes the nature of her complaint. If the patient can be carried along until she has borne a child or until the age of thirty years, medical treatment becomes less essential. Operations such as hysterectomy, uterine suspension, and presacral sympathectomy are unnecessary in the treatment of primary dysmenorrhea if the patient is properly handled. It is important to remember that encouraging results can be obtained in such patients with almost any kind of glandular product (even with placebos) because of their psychotherapeutic effect.

Women with primary dysmenorrhea have no consistent anatomic lesions or endocrine deficiencies. Ovulation and a nulliparous cervix are two essential factors in producing primary dysmenorrhea, and they result in uterine distention which stimulates contractions of large enough amplitude to produce cramping pain. The suppression of ovulation by estrogens to produce painless menses is of experimental interest, but of questionable value and possibly dangerous.

CHARLES BARON, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Lund, C. J., and Kimble, M. S.: Some Determinants of Maternal and Plasma Vitamin C Levels. *Am. J. Obst.*, 1943, 46: 635.

Forty-six mothers had repeated determinations of plasma vitamin C during the course of pregnancy. One hundred and fifty-one mothers were observed once or twice during pregnancy, and 110 of these and their infants were observed at the time of delivery. More than 500 photocolorimetric determinations of plasma vitamin C were made. From these observations the authors conclude as follows:

1. The plasma vitamin C level reflects the dietary intake of this substance. The mean plasma value for mothers with an adequate diet was 0.95 mgm. per cent; with a fair diet, 0.52 mgm. per cent; and with a poor diet, 0.18 mgm. per cent.

2. The season exerts a marked influence. During the summer months diets poor in vitamin C were uncommon (7 per cent); while at the same time most (64 per cent) of the mothers received an adequate diet. During the remainder of the year 20 per cent had poor diets and 43 per cent had adequate diets.

3. Optimal plasma values can be maintained by diet alone as long as the diet contains liberal amounts of foods rich in vitamin C. Fresh citrus fruits, tomatoes, and berries are excellent sources of ascorbic acid, and at least one of this group of fruits should be eaten each day during pregnancy.

4. Small doses of ascorbic acid, e.g., 25 mgm. daily, are of little benefit alone, and they may lead the physician into a false sense of security unless he realizes that the daily requirements of the pregnant woman are *much* greater. If the woman receives an *adequate diet* there is no need for synthetic ascorbic acid. By adding it routinely to an adequate diet the physician may waste a valuable drug which is needed elsewhere during wartime.

Blood levels of vitamin C did not change during labor. They tended to be slightly lower during the early puerperium, and were definitely but not alarmingly lower after delivery by cesarean section.

Hyperemesis gravidarum may lead to dangerously low levels of vitamin C. Clinical scurvy may appear. The retinal hemorrhages of severe hyperemesis gravidarum are a manifestation of vitamin C deficiency and are similar to petechial hemorrhages seen elsewhere. These hemorrhages cease after adequate therapy with vitamin C and therefore they are not necessarily an indication for the use of therapeutic abortion.

On rare occasions a deficiency of vitamin C may lead to post-partum hemorrhage, but the plasma values in general are not related to ordinary blood loss following delivery.

The fetus receives its supply of vitamin C at the expense of the mother and under fasting conditions the fetal values are always higher than those of the mother, the difference being relatively greatest when the maternal values are low.

Vitamin C may be maintained at a level higher in the fetal blood than in the mother's by a process of selective retention in the placenta.

F. L. CORNELL, M.D.

Farell, D. M., and Scheffey, L. C.: Ectopic Pregnancy. *Am. J. Obst.*, 1943, 46: 686.

A series of 75 consecutive cases of ectopic pregnancy was analyzed and compared with a previous review of 82 cases. The incidence among gynecological admissions was 1.3 per cent in this series, and 1.6 per cent in the combined review. In both studies the majority of patients were in the third decade of life. One-third of the patients had either not conceived previously, or, having conceived, did not carry the pregnancy to term.

Gross evidence of a chronic inflammatory change in the uninvolved tube was found in 40 per cent of the patients, and 26 per cent had had previous abdominal operations. This high incidence of inflammatory disease, and the role that postoperative adhesions may play in causing mechanical hindrance are important etiological factors in the production of an ectopic gestation.

Abdominal pain was experienced by all patients, and the onset was most frequently observed in from two to four weeks after the last previous menstrual period. Some form of irregularity of the current menstrual cycle was noted in 93 per cent of the patients. The majority of those experiencing tubal rupture reported external vaginal bleeding before the expected menses, while the majority of patients with tubal abortions and intact ectopic pregnancies gave a history of a "missed period."

Concomitant signs of pregnancy were infrequent. Pelvic masses were palpable in 59 per cent of the patients. In intact tubal pregnancy, blood studies are comparatively normal. As tubal abortion or tubal rupture occurs, the red cell count decreases, leucocytosis increases, and the sedimentation rate becomes more rapid. The biological test can be a distinct aid in diagnosis, but only when supported by other signs and symptoms of ectopic pregnancy. In 9 of the 22 patients in whom a uterine curettage was done, a decidual reaction of the endometrium was observed. Peritoneoscopy is a rational procedure and has much to offer in the confusing case.

The proportion of tubal abortions to tubal ruptures was 2 to 1; this is a reversal of the proportion recorded in the previous review. Correct diagnoses were made in 76 per cent of the combined series. Pelvic inflammatory disease was the lesion most frequently confused with ectopic pregnancy.

The total mortality rate in the combined series amounted to 3.2 per cent, while the operative mor-

tality rate was 1.9 per cent. For the first series, the operative mortality rate was 2.5 per cent, and for the present series 1.3 per cent. The deaths in both series emphasize the danger of delayed operation in tubal pregnancy. Prompt operation, and the use of blood transfusion and plasma to combat hemorrhage and shock, are efficacious means for decreasing the mortality rate. EDWARD L. CORNELL, M.D.

LABOR AND ITS COMPLICATIONS

O'Regan, J. A.: Premature Separation of the Normally Implanted Placenta. *Am. J. Obst.*, 1943, 46: 566.

At the New York Lying-In Hospital (outdoor service included) from September 1, 1932 to January 1, 1942, there were 32,434 deliveries. In this group there were 93 cases of premature separation of the placenta, an incidence of 1 to 348.

CASES OF PREMATURE PLACENTAL SEPARATION AT THE NEW YORK LYING-IN HOSPITAL SEPTEMBER 1, 1932, TO JANUARY 1, 1942.

	No.	Per cent
Premature separation of placenta (1 in 348)	93	.28
Maternal deaths	3	3.2
Infant deaths	49	52.7
Primigravida	25	26.5
Multigravida	68	73.5
Hemorrhage: Concealed	17	17.2
Hemorrhage: External	76	82.8
Type of delivery: Cesarean section	38	40.0
Type of delivery: Pelvic	55*	60.0
Toxemias	21	22.5
Hysterectomies*†	4	4.3
Total deliveries	32,434	

*Hysterectomy done for fibromyomas.
†1 patient died before delivery.

Most fatalities from premature separation of the placenta occur post partum of hemorrhage and shock. An analysis of them frequently reveals that the operator temporized too long and was not in a position to do an immediate laparotomy.

All cases of premature separation of the placenta in which pelvic delivery is contemplated, and particularly if symptoms are severe, should be delivered either in an operating room that has been set up for laparotomy, or in a delivery room with operating room facilities close by and immediately available, to eliminate time loss and blood loss should hysterectomy be necessary. E. L. CORNELL, M.D.

Watson, B. P., and Gusberg, S. B.: The Treatment of Placenta Previa, Bagging Versus Cesarean Section. *Am. J. Obst.*, 1943, 46: 524.

At the Sloane Hospital for Women, New York, there has been a definite trend in recent years toward the treatment of the graver forms of placenta previa by cesarean section.

RESULTS OF TREATMENT OF PLACENTA PREVIA

	No. of cases	Fetal mortality	Maternal mortality	Shock	Hemorrhage	Morbidity
Cesarean section	29	11.1%	3.4%	10.3%	13.7%	37.9%
Bagging	26	50.0%	11.5%	61.5%	46.1%	57.6%

Fetal mortality is corrected to exclude babies under twenty-eight weeks and those with no fetal heart on admission.

Shock, hemorrhage, and morbidity figures are corrected for cases in which such factors were present before treatment was instituted.

These results indicate the marked advantages of cesarean section over bagging for both mother and baby. There was but one death following section and in this case the patient had been treated unsuccessfully with bagging prior to operation.

As to the merits of bagging, both intraovular and extraovular bagging were successful in controlling bleeding and initiating satisfactory labor in only 19.2 per cent of the cases. Furthermore, the problem did not end with the success of the bagging, for a difficult operative delivery was necessary in 69.2 per cent of the bagging cases. Bleeding frequently recurred when the bag was expelled with the cervix still incompletely dilated. Further operative procedures then became necessary, version and extraction being the one most frequently employed.

The small group of placenta previas delivered operatively through the pelvis without bagging showed a similarly high incidence of shock, hemorrhage, and other complications. The outcome in these cases contrasted sharply with the much more favorable results of spontaneous pelvic delivery or abdominal delivery. E. L. CORNELL, M.D.

Hennessy, J. P.: Occipitoposterior Position. *J. Am. M. Ass.*, 1943, 123: 524.

The occipitoposterior position is perhaps the most common and important of the vertex presentations, occurring in approximately 25 per cent of all such presentations. Early recognition of this position is most important, as this condition always complicates labor, sometimes to a serious degree.

The first stage of labor is sometimes much prolonged and should be so managed as to minimize the suffering and exhaustion of the mother. The second stage may often be shortened with great advantage to the mother and the child.

The female pelvis is subject to many variations in size and shape; therefore each labor is different, and operative procedures must be individualized.

In the narrow fore pelvis the true conjugate is of average length; with a forward promontory of the sacrum there are more occiput transverse presentations.

In a series of 600 consecutive cases of occipitoposterior position at St. Ann's Maternity Hospital, New York, the gross fetal and neonatal mortality

was 1 per cent. The fetal mortality, therefore, was no greater than in occipitoanterior positions.

Parity and age apparently are not factors in this complication.

Large size of the baby per se is not the cause of posterior positions; it is a factor only when it is associated with deviations from the normal type of pelvis.

The occipitoposterior position need no longer be dreaded, as nearly all cases can be dealt with successfully even if anterior rotation should fail to occur spontaneously. CHARLES BARON, M.D.

Kaiser, I. H.: Rectal Stricture Complicating Labor. *Am. J. Obst.*, 1943, 46: 672.

Forty-eight labors in the presence of rectal stricture which were observed by the department of obstetrics at the Johns Hopkins hospital are reported. The incidence of grave complications is found to be lower than that previously reported in the literature. One maternal death due to rupture of the uterus, apparently unconnected with rectal stricture, occurred in this series; there was no obvious instance of rupture of the rectum.

The program evolved by this department for the management of these patients in labor depends primarily on a consideration of the location and extent of the rectal scarring in the individual patient. Cesarean section is reserved for those patients with extensive involvement of the pouch of Douglas or of the pelvic soft parts. Colostomy or precolostomy may be performed in association with cesarean section if necessary. Pre-existing colostomy is not believed to be a bar to pelvic delivery. Spontaneous delivery and avoidance of sedation are advised if pelvic delivery is decided upon, and the patient must be watched closely post partum for the appearance of signs and symptoms of rupture of the rectum.

E. L. CORNELL, M.D.

NEWBORN

Hanley, B. J., and Horn, P.: Comparative Blood Sugar Studies in the Parturient Woman and the Newborn Infant. *Am. J. Obst.*, 1943, 46: 502.

A series of patients are presented on whom blood-sugar determinations were made simultaneously on the mother and the baby at the time of delivery, also one hour and six hours later, respectively, on the infants. Two methods of blood-sugar determination were used.

With the macromethod, there was an average maternal blood sugar of 106.3 mgm. per cent, and with the micromethod, 128.7 mgm. and 126.8 mgm. per cent, respectively. Blood taken from the umbilical vein at the time of birth averaged 97.8 mgm. per cent with the macromethod, and 111.3 mgm. and 111.7 mgm. per cent, respectively, with the micromethod. Blood taken from the umbilical artery showed an average of 88.3 mgm. per cent with the macromethod, and 95.8 mgm. and 96.4 mgm. per cent with the micromethod. Blood obtained one hour after delivery, from the heel or finger of the infant, showed an average of 80.3 mgm. per cent with the micromethod. Blood obtained from the fontanel six hours after delivery showed an average of 66.1 mgm. per cent with the macromethod, and from the heel or finger of the infant 77.1 mgm. and 77.5 mgm. per cent, respectively, with the micromethod.

While all the averages were slightly higher with the use of the micromethod, the authors believe that it is an easier and perhaps a more accurate method. The use of the photoelectric colorimeter helps to eliminate a portion of human error. In spite of a large number of very low blood sugars no untoward symptoms were noted in these infants. An increase in the weight of the newborn does not cause an increase in the blood sugar. E. L. CORNELL, M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Stevens, A. R., and Lord, J. W., Jr.: The Experimental Use of Vitallium Tubes in Ureterointestinal Anastomosis. *J. Urol.*, Balt., 1943, 50: 574.

The value of vitallium tubes in ureterointestinal anastomosis by means of the Coffey I method was studied experimentally in a group of dogs. It was hoped that the tube would not permit edema at the anastomotic site and that interference with the urinary outflow might thus be avoided. Also, by keeping the lumen open at the anastomotic site the authors believed that secondary stricture would be prevented.

Twenty-six ureterointestinal anastomoses were done on 16 large dogs. In this group, the urea nitrogen of the dogs with a vitallium tube was greater than that of the dogs in which the Coffey I procedure was done without the use of the vitallium tube at the site of anastomosis. Hence, the constriction of the ureterointestinal anastomosis does not constitute the sole basis for increased nitrogen values in the dogs subjected to ureterointestinal anastomosis.

Insofar as healing at the site of anastomosis was concerned, the authors had better results without the use of vitallium tubes.

The vitallium tubes became encrusted with calcium in from three to four weeks and the admixture of urine and intestinal flora was suggested as the cause.

The article is well illustrated with photographs, charts, and a graph. The experiments were carefully controlled so that the conclusions are based on substantial experimental evidence.

ROBERT LICH, JR., M.D.

Higgins, C. C.: Transplantation of the Ureters into the Rectosigmoid in Infants. Review of 19 Cases. *J. Urol.*, Balt., 1943, 50: 657.

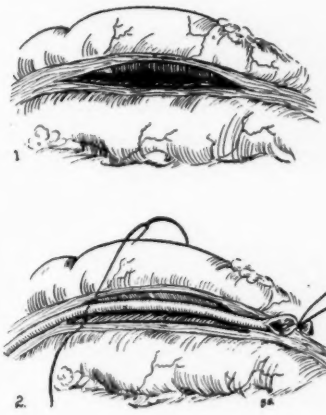
Nineteen cases of rectosigmoid transplantation of the ureters in infants for exstrophy of the bladder are reported. Two of the infants died and the remainder progressed satisfactorily.

The incidence of vesical exstrophy is approximately 1 in 40,000 births, and 7 males for each female are affected. In the series reported, 12 patients were boys and 7 were girls.

The etiology and classification of exstrophy of the bladder is discussed briefly.

Without surgical intervention 50 per cent of the children die before the age of ten and 66 per cent before the age of twenty. The responsible factors for death are renal failure and sepsis. Operation is advocated while the patient is under six months of age for the following reasons:

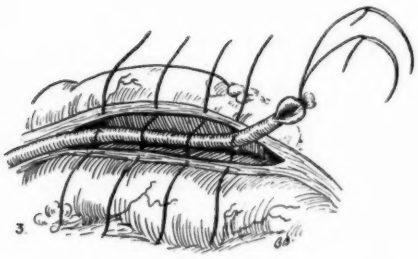
1. Infants tolerate surgery quite well.
2. The intestinal bacterial flora is less virulent than at a later time.

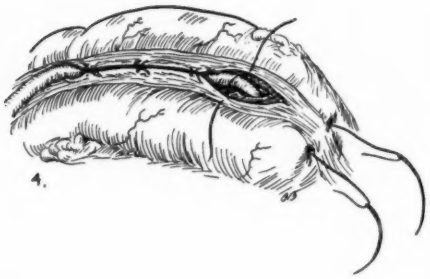


3. Recurrent attacks of pyelitis may produce sepsis before the age of 4, after which surgery is usually advocated up to the age of six years.
4. Ureterocystic obstruction may cause hydronephrosis before operation is attempted so that transplantation of the ureter may be impossible.
5. If the operation is performed early the child may have normal development both mentally and physically.
6. The operative mortality and morbidity are low.
7. The tone of the rectal sphincter is adequate after normal function is established.
8. The parents' attachment to the child is not so firmly fixed should a mortality occur.

The transplantation of the ureters is accomplished in two stages ten days apart, the right ureter being transplanted first. The cystectomy is done at the second operation, while the repair of the epispadias is delayed until the child is five or six years of age. The method of operation (a modified Coffey technique) is illustrated in the accompanying reproductions. It is emphasized that the operation is more difficult in infants than in adults, and that the anastomosis must not be made too tight to prevent hydronephrosis.

The preoperative preparation is directed toward cleansing and sterilization of the bowel and is accomplished during a four- or five-day period with enemas, sulfasuxidine, and a diet limited to milk until the day before operation, when glucose alone is allowed. Postoperatively the medication is limited to paregoric, blood transfusions if indicated, and parenteral fluids, and a rectal tube is kept in place from seven to ten days with gentle irrigation to maintain patency of the tube. The intake and output are rigidly measured and the child is kept on one side to prevent aspiration of vomitus if regurgitation occurs.





The postoperative course in this group of infants was reported to be smoother than in older children. In this series there were 2 deaths: one was due to aspiration of vomitus into the trachea, and the other was due to bronchopneumonia.

ROBERT LICH, JR., M.D.

Lower, W. E.: Late Results Following Transplantation of the Ureters into the Rectosigmoid. *J. Urol.*, Balt., 1943, 50: 581.

Six cases of ureteral transplantation to the rectosigmoid are presented. All of the patients have survived for more than twenty years, 1 for twenty-seven years; 3 are married and none has been divorced. This group of 6 individuals was selected from 80 patients in whom the ureters were transplanted for nonmalignant disease. Two additional cases are mentioned in which the patients have survived for more than fifteen years.

The following factors are emphasized in regard to the preoperative preparation of the patient.

1. The bowel must be rendered clean before surgery, and this requires four to five days in adults with daily enemas and a nonresidue diet. On successive mornings 1 oz. of magnesium sulfate is given in divided doses. On the day preceding surgery no magnesium sulfate is given but cleansing enemas are ordered repeatedly until the bowel is rid of all fecal material. Tincture of opium is given three times on this day.

2. Sulfasuxidine is administered for the four days preceding surgery. In infants the magnesium sulfate is not used and the preoperative preparation is of three to four days' duration. The diet is limited to milk or milk formula with no vegetables or cereal. On the day preceding surgery, glucose and water is used to replace the milk feeding. On the day before operation as many enemas are given as are necessary to render the bowel clean, and paregoric is exhibited. Sulfasuxidine is administered according to the age and weight of the child.

The author advises against the implantation of too much of the ureter into the bowel. In adults spinal anesthesia is considered best and in the child, ether. Provided there are no complicating factors to prolong the time of operation, both ureters may be transplanted at a single operation. As to operative technique, the simplest has proved best. The author uses no mechanical aids and uses absorbable suture throughout. The operation should be done during infancy (under the age of one year) when it is used to correct a vesical anomaly. ROBERT LICH, JR., M.D.

BLADDER, URETHRA, AND PENIS

Riches, E. W.: The Methods and Results of Treatment in Cases of Paralysis of the Bladder Following Spinal Injury. *Brit. J. Surg.*, 1943, 31: 135.

Vesical dysfunction due to spinal injury is discussed and 35 cases are briefly reviewed with reference to the end-results of therapy.

In this group, during a two-year period following injury there was a 28.5 per cent mortality. The factors influencing the prognosis other than concomitant injuries are: extent of the nerve lesion, urinary infection, and the level of the spinal lesion. The factor which can be controlled is that of urinary infection and this constitutes the subject of this article.

The methods of relieving vesical distention following injury are: noninterference and awaiting overflow incontinence, manual expression, intermittent urethral catheterization, urethral retention catheter, suprapubic catheterization, or cystotomy and suprapubic aspiration.

The method of urethral catheterization, whether intermittent or with an inlying catheter, is condemned by the author for general use. Intermittent catheterization in mild lesions is permissible, but it is never to be used for more than forty-eight hours. However, a urethral inlying catheter has no place in the treatment of vesical dysfunction associated with spinal injury unless surgical facilities are ideal.

Overflow incontinence is a safe solution of the problem of incontinence, but the chief complication of this method is urinary dermatitis and pressure sores which are particularly prevalent in women. If the vesical distention is painful it may be relieved by suprapubic aspiration, suprapubic catheterization, or suprapubic cystotomy. Suprapubic aspiration is to be used only in such cases in which surgical relief is available within a twelve-hour period.

If suprapubic catheterization or cystotomy is used it is essential that the wound be made high on the

abdomen; no lower than midway between the umbilicus and the pubis. The suprapubic route may be used with tidal drainage two days following the establishment of drainage. The necessary feature of suprapubic drainage is that the opening is watertight. An instrument is described by the author which was found satisfactory for suprapubic catheterization.

In short, the article discusses the treatment of bladder disturbance following spinal injury from the standpoint of fundamentals and the reason for each step in the treatment is based on an analysis of the series of cases presented. The article is characterized by its clarity and affords a step-by-step solution to the problem so that the condition can be handled with confidence by the physician not especially trained in this complex problem.

ROBERT LICH, JR., M.D.

Lepreau, F. J., Jr., and Blumgart, H. L.: Instrumental Removal of a Two-and-a-Half-Pound Bladder Calculus, with Recovery. *N. England J. M.*, 1943, 229: 937.

The following case is reported because it records the largest bladder calculus ever removed with complete recovery. The dry weight of the calculus was 1,134 gm. (2½ lb.). It was composed of phosphates and carbonates.

The patient, a thirty-four-year-old man, was admitted to the Hospital with a chief complaint of pus in the urine. He had had urinary difficulty for the last four years, characterized by hesitancy, slight dysuria, nocturia (one or two times), variation in the size of the stream, cloudy urine, and occasional hematuria. He had recently lost 23 lb. in weight.

Physical examination on admission showed a man appearing slightly tired and rather old for his age. Temperature, pulse, and respirations were normal. The blood pressure was 156/82. All the teeth were markedly carious. There was a stony-hard, rounded abdominal mass in the suprapubic region that extended almost to the umbilicus. On rectal examination the same mass was felt, as well as a small prostate just within the anus.

The urine was yellow and cloudy, with a specific gravity of 1.015, a slight amount of albumin, no sugar, and occasional red cells. It contained innumerable white cells, with many cocci in clumps and many small rods in the methylene-blue smear.

An intravenous phenolsulfonphthalein test was made. No dye appeared in the urine ten minutes after injection; 45 per cent of it appeared in one hour and ten minutes and 30 per cent in two hours and ten minutes. The amount of dye which appeared in two hours and ten minutes therefore totalled 75 per cent.

Intravenous urograms showed bilateral hydronephrosis and hydroureters. There was a huge laminated, calcific shadow in the bladder region, but no calcifications in the kidney and ureteral regions.

Eight days after admission, a suprapubic cystolithotomy was done under avertin, nitrous oxide, and oxygen anesthesia. A large, friable, gray calculus was removed with the aid of obstetrical forceps, and a suprapubic tube was left in place. At the close of the procedure the blood pressure was 70/60, and the pulse 108. The patient responded well to a 500 cc. blood transfusion, and 5 per cent glucose given intravenously. Two grams of sulfathiazole were given daily for two weeks postoperatively, with blood levels between 0.5 and 2.3 mgm. per 100 cc. The oral temperature was never above 100.4°F.

Cystoscopic examination three weeks after cystolithotomy showed a slightly constricted vesical neck, which was then resected with a Young's punch. The suprapubic tube was removed and a Foley indwelling catheter was left in place for five days. At discharge ten weeks after operation, the suprapubic sinus was healed and the patient was symptom-free. There were 50 cc. of residual urine, which contained many white cells and bacilli.

After discharge, the patient remained symptom-free and gained 30 lb. in weight. The urine was consistently infected with bacilli until a course of sulfadiazine cleared it two years after removal of the calculus.

A complete cystoscopic examination with retrograde pyelograms taken later in the same month was entirely normal except for trabeculation of the bladder, which had been observed preoperatively. The urine was free from infection, and there was no residual urine. The blood pressure was 140/85. The urine was normal and without infection when the patient was last seen.

JOHN A. LOEF, M.D.

Crane, A. R., and Tremblay, R. G.: Primary Osteogenic Sarcoma of the Bladder. *Ann. Surg.*, 1943 118: 887.

The literature on primary sarcoma of the bladder was reviewed. One hundred and fifty-one cases were collected and the reports were analyzed. Several tables present the information concisely tabulated. Eight cases of primary osteogenic sarcoma of the bladder were collected and 1 case was reported by the authors, bringing the total to 9. The authors' case is presented in considerable detail, and the neoplasm is discussed from its clinical, pathological, and embryological aspects. It is emphasized that the diagnosis of these tumors must be made histologically, because they demonstrate a high alkaline phosphatase content, which is characteristic of primary osteogenic sarcomas; however, bladder and kidney tissues normally have a high phosphatase content. The treatment of choice is a radical cystectomy.

The case reported was that of a sixty-nine-year-old white male who presented himself with a history of intermittent hematuria of six months' duration. At cystoscopy the diagnosis of vesical calculus was made, but upon cystotomy a phosphatic impregnated pedunculated tumor was found on the base of the bladder. A second-stage suprapubic prostatectomy was done later and two areas of adenocarcinoma were found histologically in the gland which had been removed with some difficulty. The pa-

tient's condition rapidly became worse and the alkaline serum phosphatase which had been 1.3 soon after admission became elevated to 6.0 just before death. The tumor had been removed at the time of the cystotomy, and its base fulgurated, but it soon recurred and finally filled half of the bladder. During the course of the disease metastases were found roentgenologically in the skull, and subcutaneous nodules developed, one of which was histologically identical with the primary tumor of the bladder. The patient died ten and one-half months after the appearance of his first symptom.

This article is well illustrated, and the collected and personal material is presented in considerable detail. ROBERT LICH, JR., M.D.

Lowsley, O. S.: Surgical Treatment of Plastic Induration of the Penis. *N. York State J. M.*, 1943, 43: 2273.

Plastic induration of the penis is not a rare disease, although it often remains unrecognized until its later stages.

Most writers of the present day locate the plastic induration in the septum, tunica albuginea, and Buck's fascia, and frankly admit that the cause is unknown. They point out that while antecedent or concurrent disease was present in many of the published cases, the induration was not associated with either trauma or local or general disease in the majority of them.

The induration appears as a node or nodules, a cord, or one or more plaques on the dorsal surface of the penis. It may arise at any point on the median dorsal aspect, but usually begins near the symphysis pubis or posterior to the coronary sulcus, lying below the dorsal vessels and nerves. From its point of origin, it slowly but progressively spreads to involve all or part of the shaft, and even the lateral surface of one or both of the corpora cavernosa and the depths of the septum.

Microscopically, the scarlike tissue resembles keloids, with but few blood vessels and many embryonic cells, from which develop the fibrous and osseous tissues.

Since the onset is insidious and the development slow, and for the most part painless, curvature of the penis on erection is likely to be the first sign to call the patient's attention to the disease. Pain on erection may be mild or very severe. The most common complaints are of painful and difficult erections, a lump in the penis, deformity of the penis, and difficult or impossible coitus. Nervous manifestations that are due to interference with normal sexual life are frequent in the younger group of patients.

The diagnosis should be readily established from the history and clinical findings. Plastic indurations must be differentiated from indurations of the urethral wall or of the corpus spongiosum, as well as from gumma, urethral carcinoma, and benign tumors, such as fibromas and chondromas.

Many different forms of treatment have been described. This indicates that no one method has proved entirely satisfactory. X-ray and radium have been utilized without conspicuous success, although a few cures following x-ray treatment have been reported. Electrolysis, diathermy, and other electrical treatments have proved of no curative value. The injection of fibrolysin has been advocated.

In a small series of early cases, in which the induration was confined to the septum between the corpora cavernosa, the author has had outstanding success by the surgical removal of the indurated area, and repair of the breaks in Buck's fascia with pads of fat.

The anesthesia for operation is usually spinal.

A tourniquet is placed around the proximal portion of the penis. A midline incision on the dorsum of the penis is extended from the penopubic junction to the sulcus of the glans penis. This is deepened to the fibrotic tissue and extended laterally on each side to the curved portion of Buck's fascia. The thickened tissues of the posterior portion of the septum are then dissected free, care being taken to avoid entering the corpora cavernosa more than is necessary to remove the offending fibrotic tissue.

After the removal of the indurated septum, small pads of fat are applied to the breaks in Buck's fascia which expose the venules of the corpora cavernosa, and the wound is repaired by suture of the cut edge of Buck's fascia on each side to its fellow of the opposite corpus cavernosum with catgut or silk.

The tourniquet is then released, and bleeding points are ligated or repaired with additional fat. The subcutaneous tissues are sutured over the repair and the skin is closed with silk.

JOHN A. LOEF, M.D.

GENITAL ORGANS

Moore, R. A.: Benign Hypertrophy of the Prostate. A Morphological Study. *J. Urol.*, Balt., 1943, 50: 680.

A comprehensive study on benign hypertrophy of the prostate is presented. This study is based upon 680 unselected consecutive autopsies performed in the Pathological Laboratory of the City Hospital and Lanzier Versorgungsheim of Vienna. Also, observations are made on material collected in the United States. The material for study is carefully designated in the article.

The incidence of prostatic hypertrophy is discussed in detail, and the findings of several authors are quoted. The factor of age is tabulated. The condition occurs with increasing frequency after forty years of age and reaches a maximal incidence at sixty-five years, which suggests presenility and senility as the period of greatest incidence. It is observed more often in those who are married. The oriental race is less commonly affected than is the colored or white race. Geographically there was no variation of incidence discernible. The condition seems not to affect the individual's sexual instincts. Blatt and Moszkowicz have reported that the dis-

ease occurs more often in men with female morphological characteristics, and the author suggests an extensive anthropometric study to determine the validity of this information.

Histologically, the earliest demonstrable lesion in benign prostatic hypertrophy is a hyperplasia of the periductal, periacinar, and periurethral stroma, and, rarely, of the epithelium. The nodules of prostatic hypertrophy are most often derived from the stroma and glands, particularly the periurethral glands and the acini, anterior and medial to the ducts of the lateral lobes. The true median lobe of the prostate plays a role in this process less frequently, the anterior lobe rarely, and the posterior lobe seldom, if at all. Histologically, the posterior lobe would seem to be a functionally distinct portion of the prostate.

The cytological element of the prostate, the epithelium, differs from the adult form only in its lack of secretory activity. The stroma in prostatic hypertrophy is characterized by its abundance of smooth muscle and lack of elastic tissue as compared to the normal adult prostate. Instances in which nodules are composed of smooth muscle are merely variations in which stromal hyperplasia does not encompass glands. Lymphoid masses in the prostate are associated with prostatic hypertrophy and do not necessarily indicate an inflammatory process. Still an inflammatory process may exist concomitant with prostatic hypertrophy.

Carcinomatous involvement of a single nodule in benign prostatic enlargement is rare, and when the malignancy involves both the area of benign hypertrophy and the neighboring prostate no conclusions as to origin are justifiable. Instances in which the patient is operated upon for a benign prostatic hypertrophy and dies of a prostatic malignancy, are more often due to a separate process rather than an original faulty diagnosis. Whether benign prostatic tissue may give rise to malignancy is a question of considerable controversy, and cytological variations in benign prostatic hypertrophy are often metaplastic rather than neoplastic. In the author's series, 2 instances in 375 cases demonstrated malignancy confined to a single nodule, and in 8 additional instances the areas of benign hypertrophy were involved along with nonhyperplastic areas.

There is no evidence to support the theory that selective arteriosclerosis in the outer glands gives rise to prostatic hypertrophy. Furthermore, there is no correlation between canine prostatic enlargement and benign prostatic hypertrophy in man.

Following a prostatectomy, the compressed posterior and lateral lobes expand by stromal growth to surround the urethra. The prostatic tissue compressed by the new growth is characterized histologically by a compression atrophy comparable to that found in other glands. However, insofar as the posterior lobe is concerned the process is not one of compression but of senile atrophy. The recurrence of prostatic hypertrophy is due to the growth of nodules that remain after prostatectomy, or to the development of new nodules. ROBERT LICH, JR., M.D.

Kahle, P. J., Schenken, J. R., and Burns, E. L.: Clinical and Pathological Effects of Diethylstilbestrol and Diethylstilbestrol Dipropionate on Carcinoma of the Prostate Gland. *J. Urol.*, Balt., 1943, 50: 711.

Seven cases of adenocarcinoma of the prostate gland, 6 of which were proved by biopsy, have been treated with diethylstilbestrol dipropionate since March, 1940. These cases were reported in detail in February, 1942, and 5 cases, which could be followed up, are brought up to date in this communication. In 4 cases the improvement previously reported in the general health, in the relief of symptoms, and in the local findings has continued to date. The fifth patient died of urinary sepsis and cardiac failure.

In all 5 cases, including the fatal case, serial histological examination showed definite regression in the carcinomatous tissues. There was a regression of metastatic osseous lesions, as demonstrated by serial roentgenological examination, in the single case in which such lesions were present, and a regression of metastases to the lymph nodes in another instance.

Massive doses of diethylstilbestrol and diethylstilbestrol dipropionate were used without ill effects except for transient gynecomastia in a single instance. In a single patient who presented an apparent recurrence of the carcinomatous process, a second course of treatment was as effective as the first had been in controlling the symptoms and causing a demonstrable regression of the malignant neoplasm.

The regressive histological changes observed in stilbestrol-treated carcinomas of the prostate, as compared to the histology in untreated carcinoma, may be outlined as follows:

1. In the untreated specimen the neoplastic cells present large vesicular nuclei, prominent nucleoli, and granular, reticular cytoplasm.

2. In the first stage of regression there is a decrease in the size of the nuclei associated with condensation of the nuclear chromatin. Nucleoli are no longer visible and mitoses are absent. Cytoplasmic vacuoles appear and are located predominantly at the bases of the cells.

3. In the second stage of regression the nuclei are pyknotic. The cytoplasm is practically clear and the cell membranes have ruptured with resulting coalescence of the vacuoles. With the rupture of all the cell membranes, the pyknotic nuclei and the fragments of the membranes are clustered in the centers of the acinar spaces.

4. In the next stage of regression, clear acinar spaces may be seen to contain only remnants of pyknotic nuclei.

5. In the final stage, as has been observed so far, only stroma, consisting of smooth muscle and fibrous tissue, remains. Accumulations of lymphocytes and macrophages, and deposits of brown pigment are present in some parts of the stroma.

JOHN A. LOEF, M.D.

Kretschmer, H. L.: Orchectomy in the Treatment of Cancer of the Prostate Gland. *J. Am. M. Ass.*, 1943, 123: 755.

The author reports 11 cases of carcinoma of the prostate gland treated by orchectomy. The results are shown in the following table:

Age of patient	Duration of symptoms	Bone metastases	Time since orchectomy	Result
67	1½ yr.		5 mo	Death
72	6 mo.		8 mo.	Death
68	2 yr.	o	11 mo.	Death
68	5 yr.		6 mo.	Pain in hips and legs; swelling of legs; loss of weight
75	2 yr.	o	7 mo.	Moderate pain in sacral region extending down leg
75	4 yr.	o	11 mo.	No change in leg pains
75	6 mo.		9 mo.	Patient is bedridden; loss of weight; frequent use of morphine is necessary; increase in bone metastases, with new areas of involvement
60	2 yr.	o	6 mo.	Painful urination; gross hematuria
77	5 yr.	o	11 mo.	Improvement in condition
77	2 yr.	o	7½ mo.	Patient feels well
67	3 mo.		4 mo.	Improvement in condition

In conclusion, he states,

"There seems to be a prevailing notion that, once a diagnosis of cancer of the prostate has been made, all that is necessary to effect a cure is to perform an orchiectomy. It is extremely unfortunate that this opinion has become so widespread, since this form of treatment is of recent origin; I do not believe that enough time has elapsed since the procedure was instituted to talk about cures. The conclusions are hasty, since most statistical studies on the curability of cancer are based on five and ten-year cures.

My results have not been as satisfactory as one would be inclined to believe they should be, judging from the literature." JOHN A. LOEF, M.D.

Wakeley, C. P. G.: Cysts of the Epididymis, the So-Called Spermatocele. *Brit. J. Surg.*, 1943, 31: 165.

Twenty-two cases of epididymal cysts which contained spermatozoa are reported. Six of the cases are briefly reviewed and the entire series is set forth in a table.

The etiological factors are trauma and infection, and the cysts can be either extravaginal or intravaginal, the former type predominating. The trauma results in rupture of the seminiferous tubules and a cyst is formed. Nonspecific infections seem to be the cause more often than venereal disease and the bacillus coli is the organism that is most frequently found.

The size of these cysts varies from the size of a cherry to that of an orange. The cysts all demonstrate a variable degree of translucency. The contained fluid varies from being almost clear to opalescent, but the degree of opalescence is not related to the number of spermatozoa contained. The specific gravity of the fluid is less than that of hydrocele fluid and the content of albumin is small. Upon standing the fluid separates into two layers; a clear layer on top and a whitish one below. If the cyst communicates with the seminiferous tubules the contained spermatozoa will be alive; otherwise, dead.

The treatment consists in the complete excision of the cyst, and if the cyst is ruptured in the process its base must be thoroughly fulgurated. If a portion of the wall is left it will lead to recurrence of the cyst. A direct surgical approach to the testicle by means of a scrotal incision is preferable to the much practiced inguinal incision. ROBERT LICH, JR., M.D.

Smith G. G.: Tumor of the Testicle; Analysis of the Results Obtained in 50 Patients Treated by X-Ray Therapy. *J. Urol.*, Balt., 1943, 50: 585.

Fifty cases of malignancy of the testicle are reviewed with particular reference to the value of roentgen irradiation to the lymph nodes, which are the most common site of metastasis. These cases have been analyzed statistically with regard to age at operation, duration of symptoms, and final results of therapy. The condition was found to occur most frequently in the fourth decade of life, and the prolan test and gynecomastia were of little prognostic value. Metastases occurred within two years in 87 per cent of the patients.

Of 8 individuals without metastases and not treated with roentgen rays, 2 have survived for more than four years; 23 patients without metastases were given roentgen therapy and of these, 13 are in good health after four years. Many poor results followed incomplete irradiation of the abdomen as metastases developed in the abdominal region following inadequate therapy. Furthermore, the results were not good when roentgen treatment was delayed until the appearance of metastases.

In this group, there were 12 patients with metastases, and they received irradiation treatment of both the chest and the abdomen. Three responded favorably to treatment—1 lived for more than four years, and 2 lived between two and three years.

Therapeutic roentgen-ray treatment was shown to be of value in this group of 50 patients with testicular tumors. ROBERT LICH, JR., M.D.

Innes, R. M.: The Malignancy of Testicular Cancer in Man and Dogs. *Brit. J. Surg.*, 1943, 31: 157.

There are apparently two opposed points of view on the question of malignancy of testicular tumors in man: the first is that testicular cancer is a highly malignant neoplasm; the second is that it is relatively benign, and that simple castration, with or without irradiation, is all that is required for adequate treatment. It is possible that until sufficient

data covering a large series of cases over a period of years are obtainable the truth will not be forthcoming, but it seems a remarkable fact that such divergent views exist. They might both be partly right, and some other factors, such as the selection of cases, may have contributed to these varied opinions; from this standpoint work on the animal aspect might be of great value.

With this idea in mind the author collected data pertaining to about 1,000 animals and about 1,400 human cases. In regard to testicular neoplasms, the seminoma seemed to be the common tumor in both man and dogs, but there appeared to be a far greater incidence of testicular cancer in dogs.

Twenty of the surgical canine cases had been treated by orchectomy and were followed up, some for many years. In all of the cases undergoing autopsy, many of which showed advanced tumor growth, a careful search was made for evidence of spread to the parailiac and para-aortic lymph nodes. This search included histological examination of these regional lymph nodes and of portions of the lungs.

It is impracticable to use a five-year period in dogs as indicative of cure because of the relatively short life of a dog, and many of the tumors had occurred in dogs which were already very old. It was found that the serious prognostic outlook so often adopted by many for human cases is evidently not applicable to canine cases. Most of the animals survived for a period of at least two years, some much longer, and in those which died and on which an autopsy was performed there was no evidence of even early metastatic spread after a fairly long period of survival. The possibility that earlier treatment of canine cases was responsible for this low-grade malignancy is not probable, as most of the testicular tumors were as fully advanced as human cases usually are when they appear before the surgeon.

The conclusion is drawn by the author from his investigations that the testicular carcinoma (seminoma) in dogs, which is identical pathologically with the human tumor, does not act in the same malignant way; and he agrees with the view recently expressed by Payne, namely, that the seminomas in man are not as malignant as hitherto believed.

JOSEPH K. NARAT, M.D.

MISCELLANEOUS

Knott, L. W., Bernstein, L. H. T., Eagle, H., Billings, T. E., Zobel, R. L., and Clark, E. G.: The Differential Diagnosis of Lymphogranuloma Venereum and Chancroid by Laboratory and Skin Tests. *Am. J. Syph.*, 1943, 27: 657.

With regard to the differential diagnosis of lymphogranuloma venereum and chancroid by laboratory and skin tests, the authors believe that:

1. The results of the diagnostic skin tests (Ito-Reenstierna, Frei, and Lygranum) for chancroid and lymphogranuloma venereum should be interpreted with caution. A positive reaction does not necessarily establish the diagnosis, and a negative reaction does not exclude it.

2. The specificity of the Lygranum complement-fixation test is challenged by the large number of positive reactions found in the sera of patients giving no history and presenting no clinical signs of the disease, and also by the possible cross-reactivity with other venereal diseases, particularly syphilis.

3. In a case of syphilis, the initial results of the Lygranum complement-fixation procedure are unreliable, and the test should be repeated throughout the course of antisyphilitic therapy.

4. Biological false positive tests for syphilis occur with surprising frequency in cases with chancroid, lymphogranuloma venereum, and other types of nonsyphilitic genital lesions; it is therefore emphasized that arsenical therapy should not be initiated in a patient with a dark-field negative genital lesion and a low-titered serological test for syphilis, even if the results are confirmed by repeated tests. A study of the reagin titer in repeated quantitative tests is of value in such cases.

5. The determination of the total serum protein and albumin-globulin ratio is of little value in the differential diagnosis of genital lesions.

6. The best criterion in the differential diagnosis of chancroid and lymphogranuloma venereum remains the clinical appearance of the lesion. The skin reactions and serum tests are, at best, of confirmatory value, and for reasons discussed in the text, do not alone suffice to establish a diagnosis.

JOHN A. LOEF, M.D.

Bang, F. B.: Experimental Prophylaxis of Gonococcal Infections. *Am. J. Syph.*, 1943, 27:716.

The experimental infection of the chorioallantoic membrane of twelve-day-old embryos with gonococci has been used to study the prophylactic value of argyrol, protargol, solutions of sulfonamides, and arsenicals. This is accomplished by placing the drug directly on the two-to-three-hour-old membranal infection, removing it two minutes later by suction and washing with saline solution. Controls treated with saline solution alone remain infected 94 per cent of the time.

Argyrol and protargol in water are effective in from 50 to 60 per cent of the infections. Highly concentrated (10 per cent+) solutions of all the sulfonamides, and arsenicals in propylene glycol are effective in more than 90 per cent of the infections. The relative value of these drugs determined by the 50 per cent end-point, in order of increasing efficiency, is: sulfanilamide, sulfaguanidine, sulfathiazole, sulfarsphenamine, "434," mapharsen, neoarsphenamine, clorarsen, and "524." Sulfarsphenamine and sulfathiazole were not clearly differentiated. The four arsenicals—mapharsen, "434," neoarsphenamine, and clorarsen—also had the same order of efficacy. The effect of the drug is influenced by the type of solvent used.

The available evidence indicates that part of the curative effect is local. JOHN A. LOEF, M.D.

Linner, J. H.: Suppurative Myositis and Purulent Arthritis Complicating Acute Gonorrhea. *J. Am. M. Ass.*, 1943, 123: 757.

A case of acute gonorrheal urethritis complicated by suppurative myositis and purulent arthritis is reported. The anterior urethritis was treated with intraurethral instillations of potassium permanganate and small doses of sulfathiazole given by mouth with apparent success. The suppurative myositis responded to incision and drainage. The purulent arthritis was treated successively with sulfamethazine, sulfamerazine, and typhoid vaccine given intravenously, penicillin given intravenously and, finally, penicillin given intrasynovially. Lasting improvement in the infected joint and sterilization of the synovial fluid occurred only after three intra-articular instillations of penicillin.

Suppurative gonococcic myositis is an infrequent complication. Inadequate doses of sulfonamide drugs and the use of urethral instillations or manipulations in the early treatment of the acute gonorrhea may be responsible for metastatic gonococcic infections.

JOHN A. LOEF, M.D.

Bundesen, H. N., Bauer, T. J., and Kendell, H. W.: Intensive Treatment of Gonorrhea and Syphilis; The Chicago Intensive Treatment Center. *J. Am. M. Ass.*, 1943, 123: 816.

The authors discuss the several aspects of the work at the Chicago Intensive Treatment Center, and give a brief résumé of the therapy advocated. The Center affords treatment for patients with syphilis, gonorrhea, and "acute undiagnosed genital lesions." It is noted that as a result of the close follow-up of patients, along with individual epidemiological surveys, many more cases of venereal disease have been found and treated in the Chicago area.

Not only does the Center rely on an advisory committee who are leaders in venereology, but it receives the technical assistance of Kettering and De Kruif who are particularly concerned with artificial fever therapy.

In early syphilis 3 methods of therapy are used:

1. Modified Simpson-Kendell-Rose therapy, which consists in artificial fever in an air-conditioned cabinet, plus arsenobismuth therapy (fever chemotherapy).

2. Modified Shock-Alexander therapy, a short-term multiple-syringe method of using arsenobismuth (intensive chemotherapy).

3. Modified Eagle-Hogan method, which employs a multiple-syringe technique and long-term arsenobismuth therapy.

The patients are distributed in a specific ratio for treatment with one or the other of the first two methods, and those found physically unfit for treatment by either of these methods are treated by the third method. Extensive clinical and laboratory examinations of each patient are undertaken before therapy is begun.

During the period from November 10, 1942 to October 8, 1943, 931 patients were treated by fever chemotherapy. In this group there were 2 fatalities and the cases of these 2 patients are reported. Changes in therapy which seemed indicated by the findings and clinical course of these patients were instituted and 862 patients, consecutively, have undergone treatment since the last fatality. The average hospital stay for this group of patients was seven days.

Three hundred and ninety patients were treated by intensive chemotherapy, but the authors believe that the elapse of time since treatment has been too short to permit of any definite conclusions.

Eighty-one patients were treated by long-term therapy. Of these, 52 became serologically negative, but in the authors' opinion, conclusions are not justified.

It is emphasized that the present preliminary report is submitted with a view to pointing out the safeguards necessary in establishing the value of the intensive method of treatment. The authors believe that a long period of observation will be necessary for an actual evaluation of the systems of treatment employed.

Gonorrhea is treated by 2 approved methods: (1) sulfonamide alone, and (2) sulfonamide in conjunction with artificial fever. There were 1,786 patients with gonorrhea—1,249 females and 537 males. One hundred and six patients were given artificial-fever therapy along with sulfonamides. This group of cases will be reported upon in detail at a later date.

ROBERT LICH, JR., M.D.

La Towsky, L. W.: The Clinical Use of Sulfadiazine in Nonspecific Urinary-Tract Infections. *J. Urol.*, Balt., 1943, 50: 625.

The author reports 100 cases of nonspecific urinary-tract infection treated with sulfadiazine. Four cases are briefly presented to show the amount of renal damage which may be compatible with sulfadiazine therapy. Even when the phthalein test revealed as little as 18 per cent in two hours the clinical effect of the sulfadiazine was not attended with toxic effects.

It is emphasized that a definite etiological and associated urinary-tract diagnosis must be made before sulfadiazine is administered if a suitable clinical response is to be anticipated. Blood sulfonamide-concentration studies are not considered essential except in the case of marked renal dysfunction.

A fluid intake of 3,000 cc. must be maintained and the urine kept acid for maximum sulfonamide efficiency in urinary-tract infection. That an alkaline urine is considered essential is realized by the authors, but they refer to the work of Yeaw who showed that urine in the upper *p*H levels is a good cultural media for bacteria, whereas on the acid side it is bacteriostatic for the common urinary invaders. It is pointed out that the amount of urinary excretion is more important in preventing crystalinuria than the reaction of the urine.

The article is illustrated and the results reported compare favorably with those found in the literature

on sulfathiazole. The advantage of sulfadiazine seems to be its reduced toxicity. Only 4 patients in this series demonstrated evidence of toxicity and all responded rapidly upon withdrawal of the drug.

ROBERT LICH, JR., M.D.

O'Crowley, C. R., and Martland, H. S.: Adrenal Heterotopia, Rests, and the So-called Grawitz Tumor. *J. Urol.*, Balt., 1943, 50: 756.

During the routine examination of 5,000 bodies, partial or complete adrenorenal heterotopia was found 8 times and in each instance the condition was bilateral. The literature contains less than 20 cases.

The series of cases reported was comprised of 7 males and 1 female, and this ratio is in accord with previous reports of adrenorenal heterotopia and also of hypernephroma. The condition was found to be not incompatible with life, not associated with endocrine disturbance, not particularly associated with status lymphaticus, and it did not reveal a predisposition to tuberculosis or infectious disease. These findings are in marked contrast to those in previously reported cases.

The explanation of this anomaly is not evident, and from an embryological viewpoint it is quite impossible because the adrenal gland is presumed to be separated an appreciable distance when the renal capsule is formed in fetal life. Therefore, the authors consider that only the following explanations are suitable: that our embryological data are incomplete; that exceptions occur; or that pluripotent cells which can form either renal parenchyma or adrenal cortex are present.

Mitchell and Augrist found cortical adrenal rests in the kidneys in 23 of 2,896 autopsies, and in 2 cases which revealed renal hypernephroma they found cortical adrenal rests in close proximity to the kidney tumor.

The authors report a case which demonstrated the characteristics of a hypernephroma, but the existing tumor was not connected with either the adrenal gland or the kidney. It was a large retroperitoneal mass (4 by 8 in.) situated just below the left kidney and near the lumbar spine. Its histological appearance was that of a hypernephroma; no tubular structures were present. There was an extension into the left renal vein and the lungs revealed numerous "golf-ball" metastases. The location of this tumor, along the side of the lumbar spine, where accessory adrenocortical tissue often occurs, suggests that the tumor arose from rests of adrenal cortex.

Fig. 1. A good example of partial adrenorenal heterotopia. Note the small mass of cortical tissue embedded in the kidney parenchyma beneath its capsule and a large portion of what appears to be the normal adrenal gland entangled in renal capsule and protruding externally. Medullary tissue can sometimes be found in the extracapsular portions.

ROBERT LICH, JR., M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Taylor, H. K.: Aseptic Necrosis and Bone Infarcts in Caisson and Noncaisson Workers. *N. York State J. M.*, 1943, 43: 2390.

Bone infarcts and areas of aseptic necrosis have been found in individuals who worked under increased atmospheric pressures. Lesions of a similar type have also been observed in individuals who were never exposed to increased pressures.

Fifty patients were studied, 39 males and 11 females. Of the 39 males, 11 gave a history of continued occupational exposure, and 1 gave a history of a single exposure to compressed air. The others presented no occupational history.

Joint and shaft lesions of aseptic necrosis and bone infarcts were observed in 12 individuals who had

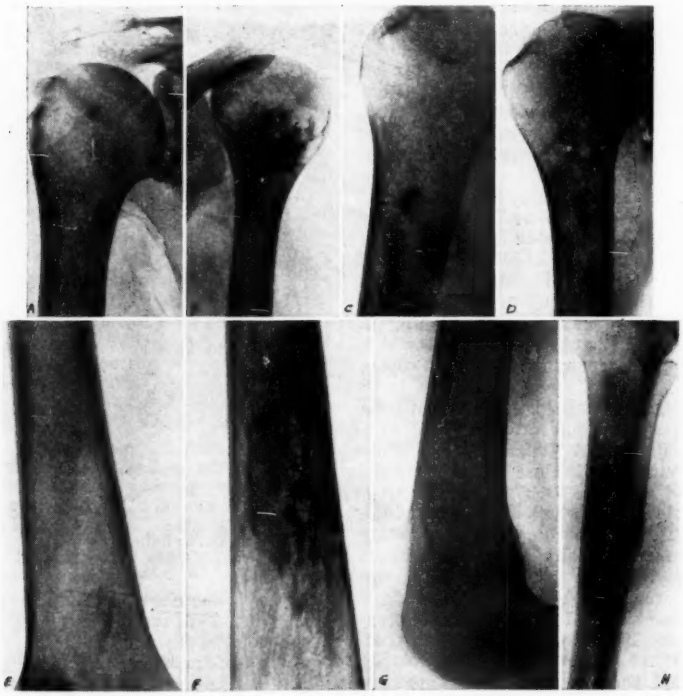


Fig. 1. (a) Male, age forty-six. Astrocytoma. Localized calcification in the upper end of the humerus. Never worked under increased pressures. (b) Female, age thirty. Progressive pseudohypertrophic muscular dystrophy. Large irregular calcified focus in the diaphyseal and epiphyseal end of the humerus. (c) Male, age eighty-four. General arteriosclerosis. Irregular calcific density in the upper end of the shaft of the humerus. Never worked under increased pressure. (d) Male, age fifty-nine. Hemiplegia. Hereditary hemorrhagic telangiectasia. Irregular calcific deposits in the upper end of the humerus. Never worked under increased pressure. (e) Male, age forty-five. Multiple cerebral fat emboli. Multiple fractures. Irregular calcific deposit in lower end of shaft of femur. Never worked under increased pressure. (f) Male, age eighty-six. Chronic productive type tuberculosis. Large irregular calcific deposit in lower end of femur. Never worked under increased pressure. (g) Male, age forty-four. Construction worker. Never worked under increased pressure. (h) Male, age fifty-seven. Arteriosclerotic heart disease. Mesenteric thrombosis. Peripheral vascular disease. Never worked under compressed air.

been working under compressed air for varying periods of time. Some of these individuals had been subjected to sudden changes of atmospheric pressure and had developed symptoms of aeroembolism, or decompression illness, or bends. Others had not been subjected to sudden changes in atmospheric pressure; of this group, some developed mild or subacute symptoms of decompression illness and others did not.

The lesions of the shaft and joints do not develop immediately following decompression illness. Considerable time must elapse. The shaft lesions are usually asymptomatic and are usually discovered accidentally. The joint lesions develop secondary arthritic changes and present an appearance like, and are similar to, a chronic hypertrophic osteoarthritis. Shaft lesions are found in some patients and joint lesions in others. Some present both types of lesions.

The same types of lesions were observed in 38 individuals who had never worked under compressed air and had not been subjected to sudden or violent changes in atmospheric pressure.

The lesions in both groups present similar roentgen appearances and cannot be differentiated from one another. In the caisson worker the causative factor is the inert gas, nitrogen, in bubble formation (as an embolus, as pressure, or both) which interferes with the circulation to the part. In the noncaisson worker there is no apparent causative factor for the development of these lesions. The obstructing factor or factors affecting the circulation are unknown.

The bone lesions may be single; usually they are multiple, and often they are bilateral. Workers under compressed air presented extensive and multiple lesions more often than other workers. In the non-caisson worker, in whom the lesion is single and not extensive, the reparative changes are usually greater.

Deep-sea divers and aviators may develop aeroembolism. There is no recorded evidence of the occurrence of bone changes in either naval or air personnel who have had aeroembolism.

ROBERT P. MONTGOMERY, M.D.

Toth, B. J., and Wintermantel, J. A.: An Apparently Solitary Myeloma of Bone with Subsequent Generalization. *Radiology*, 1943, 41: 472.

Forty-eight cases of so-called solitary myeloma have been recorded in the literature. Only about one-fourth of these, however, are known to have remained solitary after observation for a period of four years.

The important point is that all of these lesions apparently have a better prognosis and respond more favorably to treatment than the classical multiple myeloma. Paul and Pohle incline to the belief that myeloma may occur in varying degrees of malignancy, with rapid progress in the classical cases and a relatively benign course in the so-called "solitary" lesions. This assumption naturally would favor the outlook in cases with early institution of proper treatment.

From the roentgen diagnostic point of view, two main types of lesion have been described. The first is the purely osteolytic lesion with sharp demarcation and little, if any, expansion. This type is most frequently located in a single vertebra or in the shaft of a long bone and is easily mistaken for an osteolytic cancer metastasis.

The second type of lesion, the so-called giant-cell

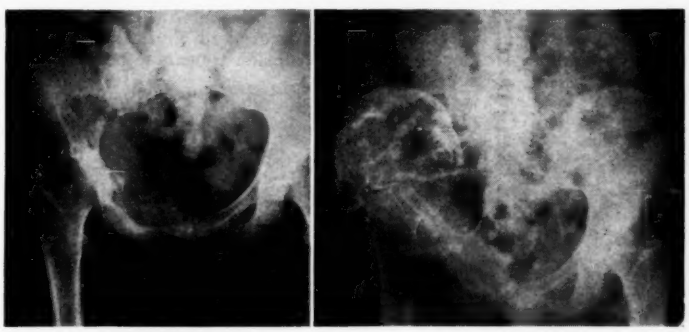


Fig. 1. left. Roentgenogram of the right hip, October 20, 1939. There is practically complete destruction of the entire superior ramus of the right pubic bone, with some faintly seen flake-like remnants of bone, suggestive of expansion. The destruction involves the acetabulum as well as part of the innominate bone. This latter involvement is purely osteolytic, with coarse trabeculation and lack of periosteal reaction or bone production. Probably some infiltration of the soft tissue is present.

Fig. 2. Roentgenogram of the pelvis, June 9, 1942. Note the trabecular recalcification in the place of previous destruction. The entire lesion, including the soft-tissue swelling, is reduced in size.

type, is a multicystic osteolytic, destructive lesion, which presents rather sharp demarcation and occasional expansion. The giant-cell type seems to show less tendency toward generalization and perhaps a better response to treatment, especially to irradiation treatment.

Upon reviewing the case, as well as the literature on the subject, it becomes evident that there are considerable difficulties in the roentgen diagnosis of these at least temporarily solitary myelomas. They are most commonly confused with giant-cell tumors. Pohle believes that the age of the patient, location of the tumor, the evidence of cortical destruction, and the somewhat coarser trabeculation may help in the differentiation.

In conclusion, the authors agree with Paul and Pohle that, "at the present time, it is not possible to make an unequivocal diagnosis of solitary myeloma from roentgenologic examination alone, although the probability of its existence may be correctly stated." Biopsy and marrow puncture, together with blood studies and repeated urinalyses, should be done in all the suspected cases to establish the correct diagnosis as well as to determine possible generalization.

A case is presented of an apparently solitary myeloma originating in the right pubic bone with subsequent generalization. The difficulties of roentgen differential diagnosis and the favorable influence of roentgen irradiation are discussed.

Attention is called to the severe reaction—chills and high temperature—following comparatively small doses of x-ray treatment.

The case presented was probably of the giant-cell type and apparently originated in the superior ramus of the right pubic bone, with subsequent involvement of the right ischial, innominate, and left pubic bones.

Contrary to the statement which was made by Stewart and Farrow, that bulky plasma-cell myeloma is radioresistant, there was a favorable response to irradiation treatment in this case.

ROBERT P. MONTGOMERY, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Piñeiro Sorondo, J.: Shoulder: Fusion for Deltoid Paralysis. Author's Technique (Hombro: Artrodesis por Parálisis del Deltoides. Técnica Personal). *Rev. As. méd. argent.*, 1943, 57: 746.

A technique of fusion for deltoid paralysis is described with which solid fusion is obtained in a period of three months. Two cases have been operated on.

The tibial graft is placed on the anterior aspect of the humerus and scapula, and is covered by the subscapularis muscle, the glenoidal labrum, the two heads of the biceps, and the anterior articular capsule. (Fig. 1).

The skin incision (Fig. 2) is followed by incision of the atrophic deltoid. The capsule and periosteum are elevated together with little bone flakes, care being taken not to cut the long head of the biceps. An osteotome is used. The cartilage of the head and the cartilage of the glenoid cavity are removed. The insertion of the glenoidal labrum is cut a few millimeters on the anterior rim of the glenoid cavity. The periosteum elevator prepares a bed for the tibial graft. This bed lies between the scapula and the subscapularis muscle. The tibial graft is introduced in its bed, and the glenoidal labrum holds the graft against the neck of the scapula. The final position of the graft is illustrated in Figure 3, and when this has been obtained the sutures are inserted.

After the operation, a plaster cast is applied, to maintain the proper position. This plaster is removed three months later. Then a splint is used for two weeks and physical therapy is begun, provided that fusion appears to be firm in the x-ray film.

HECTOR MARINO. M.D.

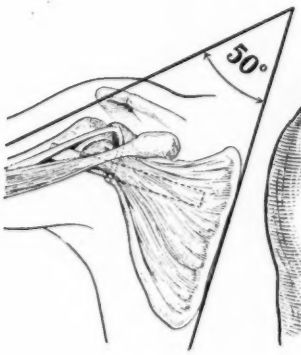


Fig. 1

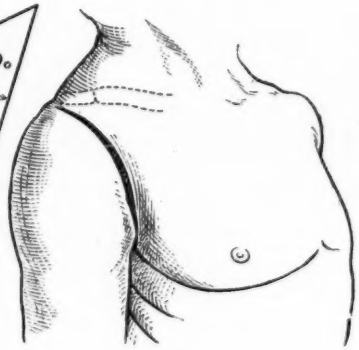


Fig. 2

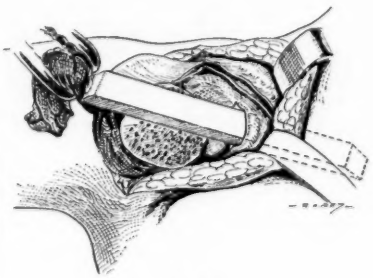


Fig. 3

Figueiredo, L., Jr.: Separation of the Epitrochlea with Interposition of the Detached Fragment (Arrancamento da epitroclea com interposicao do fragmento destacado no articulacao). *Rev. Brasil. ortop.*, 1943, 4: 177.

Although separation of the epitrochlea is relatively common, interposition of the separated fragment is rare. In order of frequency in fractures of the elbow, separation of the epitrochlea is exceeded only by supracondylar fracture and fracture of the external condyle.

The author reports 5 cases of separation of the epitrochlea, all in boys seven, seven, nine, twelve, and thirteen years old, respectively.

A fracture of the epitrochlea (also called internal epicondyle) is rarely produced by direct force, the more common mechanism being that of traction on the hand with the elbow in a position of extension and forced abduction. According to Kocher, a fracture of the epitrochlea may be the result of a spontaneous reduction of an incomplete or complete posterior and external dislocation of the elbow. Interposition may be primary or secondary, following maneuvers for the reduction of dislocation. As far as the upper extremity is concerned, the frequency of separation of the lower extremity of the humerus is exceeded only by that of separation of the epiphysis of the lower end of the radius. As far as the frequency of separation of the epiphysis of the lower end of the humerus is concerned, separation of the epitrochlea occupies first place. The separation may occur in individuals up to twenty-one years of age, but it is found most often at the age of twelve years. Four-fifths of all cases occur in the male sex.

In the presence of a dislocation the latter dominates the clinical picture. Palpation reveals a sharp pain in the region of the epitrochlea. There are signs of hemarthrosis. Abnormal abduction may be obtained but it produces pain. In all posteroexternal dislocations of the elbow a separation of the epitrochlea should be suspected. Interposition may be detected in anteroposterior and lateral views of the injured elbow in roentgenograms.

Fevre suggested the following two steps for reduction: (1) forced abduction of the forearm with the elbow in extension, and (2) progressive flexion of the elbow. The mechanism of reduction must vary with the type of interposition. The author employed Fevre's technique successfully in 3 cases.

He is of the opinion that a closed reduction should be employed except in the cases accompanied by paralysis of the cubital nerve, in old cases, or in those in which closed reduction failed.

JOSEPH K. NARAT, M.D.

Piñeiro Sorondo, J., and Ferré, R. L.: Severe Flat Foot in the Adolescent: Its Surgical Treatment (Pie plano grave del adolescente: su tratamiento quirúrgico). *Rev. As. méd. argent.*, 1943, 57: 300.

The article describes the operative technique of Piñeiro Sorondo for flat foot.

The operation consists of:

1. Fusion of the posterior talocalcaneal joint only (the talocalcaneonavicular joint is not touched)
2. Transplantation of the peroneus brevis tendon to the tibialis posterior tendon.

Six feet have been operated on with this technique; the results have been very good. The operation is performed as follows:

The superficial fascia is incised with care to avoid the small saphenous vein and the sural nerve. The posterior talocalcaneal articulation is dissected and prepared for fusion. After the fusion the calcaneus is held in 10 degrees of inversion. If necessary, a peg of bone 20 by 10 by 5 mm. is taken from the posterior aspect of the tibia and placed in the external part of

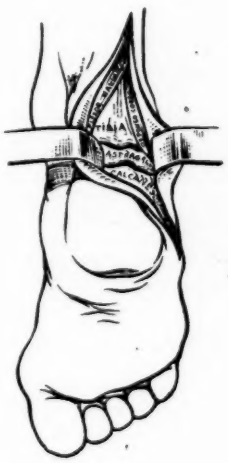


Fig. 1

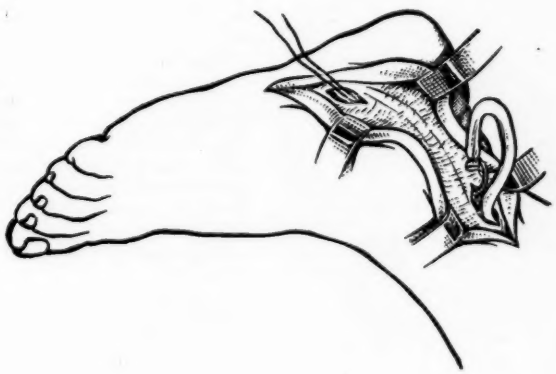


Fig. 2

Fig. 3

the posterior talocalcaneal joint, to maintain the calcaneus in slight inversion (Fig. 1).

Two slits are cut in the sheath of the peroneus-brevis muscle. The peroneus-brevis tendon is cut through the distal slit, close to the fifth metatarsal bone, and the muscle is taken out through the proximal slit (Fig. 2). A medial incision is then made and this muscle is then sutured to the tibialis-posterior muscle. Now the peroneus brevis has become an invertor muscle of the foot and helps the tibialis posterior to raise the arch. Figure 3 shows the position of the peroneus-brevis muscle after it has been transplanted.

After the operation a plaster is applied up to the middle of the thigh. The knee is held in 170 degrees of extension, the foot in 90 degrees of extension on the leg, the calcaneus in 10 degrees of inversion, and the forefoot in neutral position. Fifteen days later the stitches are removed and a walking cast is made; this cast holds the bones in the same position. Three months after the operation this second plaster is removed and the patient is allowed to walk with an arch support. Physical therapy is then instituted.

HECTOR MARINO, M.D.

FRACTURES AND DISLOCATIONS

Magnuson, P. B., and Stack, J. K.: Recurrent Dislocation of the Shoulder. *J. Am. M. Ass.*, 1943, 123: 889.

The glenoid cavity has little function in maintaining the head of the humerus in position and the capsule of the joint is a weak and loose bag. The muscles of the shoulder and arm which originate at the shoulder girdle and insert in the humerus or below are really responsible for the maintenance of proper position. If the muscles of the shoulder girdle are properly attached and work in harmony, the head of the humerus will be maintained in its normal position. The authors believe that the pathological circumstances predisposing to habitual dislocation consist of certain combinations of lesions of the soft parts.

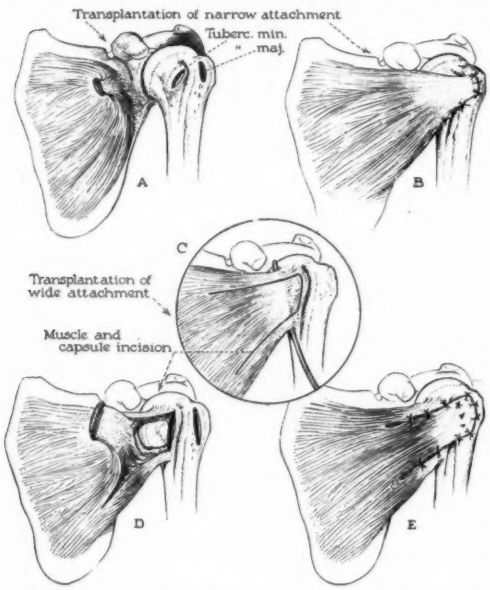


Fig. 1. Medial reflection of tendinous attachment and exposure of the head of the humerus.

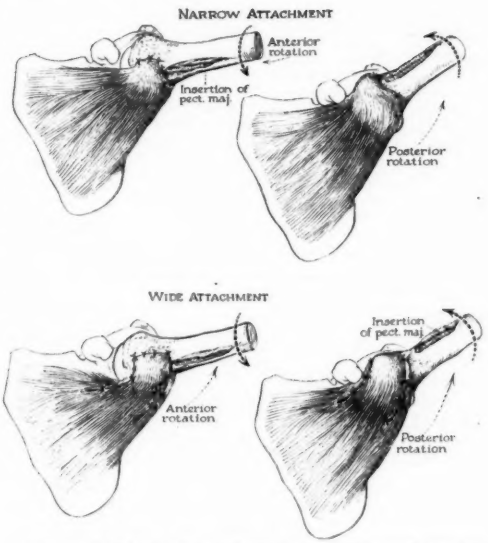


Fig. 2. Method of attachment of muscle and tendon under the head of the humerus.

The subscapularis tendon when allowed to recede forward and downward constitutes a weak point in the proper maintenance of the humerus in the glenoid. On the basis that the head of the humerus is allowed to slip out of the glenoid, the tightening of the grip of the subscapularis around the head of the humerus by moving its attachment to the greater tuberosity might correct all or any one of such tears or relaxations. From the antomicopathological standpoint this explanation seems more reasonable than that of weakening of the capsule. The lesion is in all probability a combination of improper anterior support by the tendons of the subscapularis and partial detachment of the supraspinatus and infraspinatus muscles.

A group of 6 cases are reported in which a new operation for the cure of recurrent dislocation of the shoulder was performed. The first operation was performed two years ago, and the last, six months ago. None of the patients have had any recurrence to this date and all have normal shoulder function. The cases are reported at this time with the sole purpose of suggesting this operation to other surgeons so that

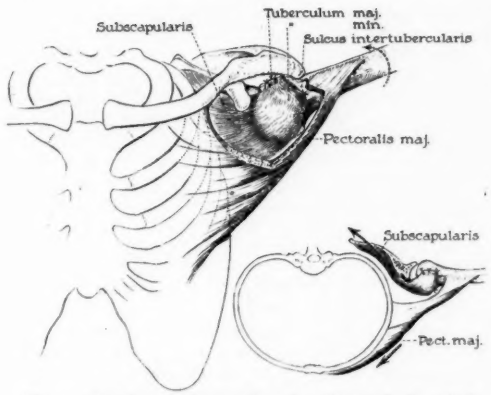


Fig. 3. Tendon and muscle of subscapularis winds firmly around head of humerus.

their reports can be studied. Five-year cures are suggested before permanent results are reported.

The operation consists of an incision over the junction of the anterior and medial third of the deltoid, its origin to be from the acromion. The arm is rotated externally. The tendon of the subscapularis is picked up with a narrow smooth retractor and its relationship to the surrounding structures noted. The tendon is then put under tension with a retractor and an incision is made following the upper and lower border of the subscapularis muscle and its attachment along the anterior lip of the bicipital groove. The tendinous attachment with a wedge-shaped piece of bone is lifted. The arm is brought into internal rotation and the attachment of the subscapularis tendon is stretched across the bicipital groove to the greater tuberosity. The site of attachment of the subscapularis muscle should be removed far enough to tighten the muscle up at 50 per cent external rotation. A wedge-shaped opening is made into the greater tuberosity and the wedge-shaped piece of bone attached to the subscapularis tendon is forced into the new opening. The tendon is sutured to the capsule on both sides of the wedge. The lower border of the muscle and tendon are tacked down by interrupted sutures far enough under the head of the humerus so that the muscle and capsular tendon have a firm grip around the head of the bone when the arm is brought into abduction and external rotation.

After a properly performed operation there will be a 25 to 50 per cent limitation of external rotation.

RICHARD J. BENNETT, JR., M.D.

Morton, H. S.: A Method of Reducing Fracture-Dislocations of the Cervical Vertebrae, with a Report of 2 Illustrative Cases. *J. Bone Surg.*, 1943, 25: 859.

A method of reducing cervical fractures and dislocations is described. It employs the leverage of the mandible against the occiput as a fulcrum. An ironing board may be used as the fulcrum for the occiput, and shoulder guards or straps to provide countertraction. Photographs and x-rays show remarkable results.

DANIEL H. LEVINTHAL, M.D.

Nickerson, S. H.: March Fracture or Insufficiency Fracture. *Am. J. Surg.*, 1943, 62: 154.

Because march fracture is essentially a disorder due to local inadequacy of the metabolism which renders the bone more prone to fracture, the writer wishes to present the term "insufficiency fracture," as being more representative of the lesion which involves bones other than the metatarsal. Earlier diagnosis, before fracture has occurred, is desirable. It is only in this manner that the convalescence will be shortened and many man-hours of training saved.

Since the completion of this article, the author had occasion to study more than 100 such insufficiency fractures and he found that all the observations made in the first short series were true. To recapitulate, those cases which exhibited early periosteal proliferation did not fracture; those which did not exhibit early periosteal proliferation fractured, probably because of the absence of the periosteal buttress. Those that did fracture always demonstrated displacement of the distal fragment laterally, which indicated the presence of a definite force in a constant direction. The author emphasizes that insufficiency fracture is, in its early stages, a pseudofracture, which should be included in the same group as the pseudofractures caused by other poor nutritional states. The nutritive changes caused by hyperemia are manifested by:

1. A zone of rarefaction with local weakening of the architecture.

2. Periosteal proliferation on the contralateral side. This will often be the latent or asymptomatic stage.

The vast majority of the cases show the obliquity of the break to run from the cortex downward distally and inward toward the medulla.

A study of the anatomy of the pubis, femur, and metatarsal bones reveals the fact they are acted upon by large muscle groups. In the case of the metatarsal bones the volume of the intrinsic musculature is comparatively large in proportion to the size of each shaft. The writer believes that great importance should be attached to the fact that the attachments of these muscles are in the form of large fleshy bellies that are unlike the skeletal anchorages of such tendons as the biceps, triceps, quadriceps, and tendo achillis.

The salient difference between large fleshy bellies, which constitute all of the aforementioned muscles, and tendinous structures, is that the latter are comparatively avascular and the former highly vascular.

During activity there is an increase in the vascular demand. This would be accentuated by the prolonged activity of the large fleshy bellies of the aforementioned muscles. The effect of this increased local circulatory response over a protracted period of time would result in local nutritional changes. This is reflected in the bone by local decalcification of the

skeletal architecture. It is only when the bone begins to "give" in its cortex, that the x-rays show a loss of continuity.

If a force which causes a bowing outward of the laminated system continues to the point of fracture, it will be the outermost layers which are closest to the periphery that will burst or be "sprung" first. This would, in effect, cause a gaping of the peripheral layers of the cortex and leave the more centripetally placed layers bent but not broken. In the pubis, these conditions could not obtain, because of the conformity of the bone. Therefore, one will never see a displacement in the pubis since there is only one break in the pubic ring.

In general, a section through the zone of absorption showed an inactive type of bone with a few osteoblasts. There were no osteoclasts. In the marrow portion of the break (or zone of decalcification) a few marrow cells were present, but most of the marrow consisted of fat and fibrous tissue.

Efforts are being made—a subsequent report will follow—to effect certain modifications of the shoes of the freshly inducted soldiers in order to obviate this condition in the metatarsal bone.

ROBERT P. MONTGOMERY, M.D.

Ingersoll, C. F.: Ice Skater's Fracture: A Form of Fatigue Fracture. *Am. J. Roentg.*, 1943, 50: 469.

The author describes 3 cases of fracture in the lower third of the fibula, occurring in each instance in a nine-year-old boy after skating. These spontaneous fractures are given the name "fatigue fractures." The etiological mechanism is explained by the leverage against the fibula during the outward rotation of the foot which causes the talus to act as a pinch lever, or by rotation of the ankle-joint mortise on the talus. DANIEL H. LEVINTHAL, M.D.

ORTHOPEDICS IN GENERAL

Schwab, R. S., Watkins, A. L., and Brazier, M. A. B.: Quantitation of Muscular Function in Cases of Poliomyelitis and Other Motor Nerve Lesions: Electrical Excitability Tests and Electromyographic and Ergographic Studies. *Arch. Neur. Psychiat.*, Chic., 1943, 50: 538.

Since Sister Kenny has advanced the theory of muscle spasm in poliomyelitis, it has become increasingly important to determine actual quantitative power in individual muscles and in muscle groups. Clinical methods for the detection of muscle power and the extent of spasm in muscles are crude and unreliable, and therefore the authors studied muscle function by means of three separate quantitative procedures:

1. Electrical excitability was studied by voltage-capacity curves.
2. A measurement of work performed by muscles was measured by an ergograph.
3. The electric potential of muscles was studied by means of electromyograms.

This particular battery of tests was also applied when regeneration phenomena were observed after injury of the peripheral nerves.

The correlation between the various methods is very well demonstrated in the article with an injury of the radial nerve and the power of the extensor carpi radialis muscle. So far the method has not been applied to cases of poliomyelitis, but detailed reports on this aspect are in prospect, and they should prove of considerable interest in clearing up the controversial subject.

ADRIEN VERBRUGGHEN, M.D.

Poynton, F. J.: Arthritis in Poliomyelitis. *Lancet*, Lond., 1943, 245: 433.

The problem of arthritis in its association with poliomyelitis is one that frequently crops up in groups of cases, and this article concerns a series of cases of poliomyelitis seen during October, 1942, at the Bath and Wessex Orthopaedic Hospital.

In this series a number of cases of arthritis were observed. The ankles, knees, hips, elbows, and wrists were among the joints affected. The onset of arthritis occurred with the acute stage of the poliomyelitis in some cases; in other cases it appeared considerably later, when the patient was under casual treatment. In some patients it appeared even before any treatment had been administered. Although occasionally the joints remained stubbornly swollen, complete recovery was effected in some of these patients, while in others the joints became ankylosed and fixed.

This arthritis was extremely painful and troublesome, especially when it involved the hip joint. In the acute stage of the condition roentgenography afforded little definite information. In the chronic cases there was some rarefaction of bone and thickening of the joint capsules. The sudden occurrence of arthritis, weeks before the poliomyelitis had passed off, suggested a similarity between this periodicity and that of the "jump" cases of poliomyelitis in which there is renewed activity of the disease with paralysis after the first attack has passed off.

Various explanations for this condition and its periodic occurrence in outbreaks of poliomyelitis have been offered. It seems most likely that the arthritis is a manifestation of the virus infection and an unusual phenomenon of the general disease. It is of the utmost practical importance that a correct diagnosis be made, for it would be a matter of great concern if the general practitioner should mistake poliomyelitis for acute rheumatism. In both conditions there is extreme pain on movement, but cardiac complications and the rapid rise of sedimentation of the blood are suggestive of rheumatism.

Tuberculous arthritis, particularly in its early stages, and osteomyelitis may have to be considered.

Meningococcal arthritis is well known, and the examination of the spinal fluid should differentiate this condition from poliomyelitis. There seems to be a link between this virus disease, poliomyelitis, and its arthritic manifestations, which may have some

connection with rheumatoid arthritis and the nervous lesions seen in acute rheumatism.

ADRIEN VERBRUGGHEN, M.D.

Mazet, R., Jr.: The Use and Abuse of the Anatomic Splint in the Treatment of Fractures of the Lower Extremity. *J. Bone Surg.*, 1943, 25: 839.

A series of cases is presented illustrating some of the hazards of external pin-fixation methods. These include superficial drainage about the pins, which is practically unavoidable. Bone change was seen in one case following prolonged drainage. Failure to pierce both cortices of the bone caused the pins to loosen. Spiral and oblique fractures did not respond very well to too early weight-bearing as the elasticity of the pins permitted motion at the fracture site. However, the author believes that while the anatomic splint is not the remedy, it is a valuable addition to fracture treatment, especially in military fractures necessitating transportation of the patient over very long distances.

DANIEL H. LEVINTHAL, M.D.

Pruce, A. M., and Hagen, W. H.: Clawing of the Great Toe Following Improper Application of Plaster. *J. Am. M. Ass.*, 1943, 123: 955.

Eight cases of clawing of the great toe which was not present at the time of injury were observed among several hundreds of patients who had been referred to the physical therapy department by orthopedic surgeons during the past eighteen months. The deformity appeared in the presence of chronic infection, prolonged healing following surgery of the foot, and osteomyelitis resulting from gunshot wounds or compound fractures when prolonged immobilization was imperative. The improper application of plaster foot casts is largely responsible. The deformity becomes relatively fixed and extremely resistant to treatment.

This condition has been seen in children following poliomyelitis, infections of the sole of the foot, peroneal muscle atrophy in Friedreich's ataxia, other similar degenerative processes of the nervous system, and failures of development. Prevention of this condition is the most important aspect of this report. More care must be exercised in the application of foot plaster splints. The sole of the foot should be held so that the plantar toe part of the cast is carried in a straight line to the tips of the toes, and both the metatarsal and longitudinal arches should be well preserved by molding the plantar surface of the cast with the hand.

The development of this deformity can seriously retard full recovery and may prevent the return of otherwise healthy soldiers to full military duties.

RICHARD J. BENNETT, JR., M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Nario, C.: Surgery of the Abdominal Aorta; 2 Cases (Cirugia de la aorta abdominal; 2 casos). *Bol. Soc. cir. Uruguay*, 1943, 14: 422.

The first of the author's 2 patients developed pain in the left lower extremity following pleurisy. Within twenty-four hours the pain, attributed to an arterial spasm, was replaced by a syndrome of flaccid sensory motor paraplegia which attained its height after thirty hours. The lower extremities were cyanotic, immobile, and cold. The arterial pulse could not be palpated, the osteoperiosteal reflexes were absent, and there was a tactile-thermic anesthesia.

A diagnosis of thrombosis of the abdominal aorta below the origin of the renal arteries was made and the patient was operated on under local anesthesia in the Trendelenburg position. The abdomen was opened through a left paraumbilical incision. Signs of periaortitis and atheromatosis of the aorta were found, in addition to an induration of the bifurcation. Temporary hemostasis was accomplished with a Nelaton catheter placed around the aorta below the origin of the renal arteries. An incision, 1.5 cm. long, was made through the anterior wall of the aorta below the inferior mesenteric artery. An embolus adherent to the arterial wall was removed and residual coagula were aspirated from the iliac arteries through a rubber catheter. The incision in the aorta was closed with interrupted sutures and the abdominal wall was sewed up in the usual manner.

The patient expired suddenly sixteen hours after the operation. A cerebral embolism was believed to be the cause of death.

The second patient, fifty-two years of age, was admitted with a syndrome of pain in the right hypochondrium, radiating to the left side and to both lumbar regions. The pain had been present four years prior to admission to the hospital. On physical examination a tumor was discovered above the umbilicus; its upper limits were not distinct; the transverse diameter of the tumor was between 5 and 6 cm.; the surface was lobulated and the consistency hard; the tumor was not painful to palpation. Apparently the tumor was attached to the prevertebral space.

The diagnosis of a retroperitoneal tumor was made and the existence of an aneurysm of the aorta or of a primary lymphatic tumor was considered. An operation was performed under spinal anesthesia. A left paramedian incision above and below the umbilicus opened the abdomen and an aneurysm at the bifurcation of the aorta was exposed. The tumefaction had a hard consistency and was between 5 and 6 cm. in diameter. A perianeurysmal sympathectomy preceded the typical Halstead operation. Gradual, partial ligation of the aorta above the aneurysm terminated the operation. The abdominal wall was closed in the usual manner. The immediate postoperative course was uneventful and the check-up later showed the patient to be in good condition.

The author was able to find in the literature only 9 cases of ligation of the aorta which had been done on account of an aneurysm. Usually a strip of fascia is used for partial ligation of the aorta.

JOSEPH K. NARAT, M.D.

Langley, G. F.: Repair of a Ruptured Popliteal Artery, with a Note on Heparin Therapy After Arterial Suture. *Brit. J. Surg.*, 1943, 31: 161.

A case of rifle bullet wound of the popliteal region presented several features of interest. The original wound produced a large rent in the popliteal vein but the adjacent popliteal artery showed only a slight abrasion of its adventitia. The vein was doubly ligated, sulfanilamide powder was insufflated, and a dry gauze pack was lightly inserted, over which the wound was partly sutured. On the eleventh day the sutures were removed and some of the pack was easily withdrawn. Inadvertently, the patient was allowed out of bed and a brisk hemorrhage occurred after he flexed his knee in a chair. The hemorrhage was controlled by a tourniquet followed by pressure bandaging. A Thomas splint was applied until the twenty-third day. On the twenty-seventh day the patient was allowed out of bed. On the thirtieth day thereafter he complained of a pain in the calf, and on the following day a large pulsating swelling was noted in the popliteal space. Slight pulsation was felt in the posterior tibial pulse but none in the anterior. Oscillometry showed moderately good circulation. It was felt that delay might establish a better collateral circulation if ligation were inevitable. On the fortieth day the aneurysm burst through the wound. Tourniquets were applied above and below the popliteal region and the popliteal space was opened. After the removal of clots, a longitudinal split, ¾ in. long, was seen in the posterior wall of the upper part of the popliteal artery. The adjacent vessel wall looked surprisingly healthy in contrast to the surrounding clot-infiltrated tissues. With very fine paraffined thread on arterial needles, two layers of continuous mattress sutures were inserted, the second drawing the adventitia over the former. Novocain was injected into the adventitia.

The clotting time was immediately checked and heparin therapy was commenced. The aim of heparinization was to prolong the clotting time to about five times the normal level, and this was done with frequent checking of the capillary clotting time. Initial heparinization was undertaken by the single-dose technique in an attempt to estimate the requirements before saline-heparin was given by the intravenous drip method. The maximal effect of a single dose appears within the first hour and the effect rapidly declines. The initial dose

is higher than the subsequent maintenance requirement. It thus seems probable that a single injection of 5,000 units could be followed by an intravenous saline-heparin drip of about 3,000 units per hour commencing just before the end of the first hour. Estimation of the clotting time at twenty-minute intervals during the first two hours would seem advisable in order to ensure early stability. Five days of heparinization contributed to the saving of the limb. The heparin was discontinued because of capillary hemorrhage which extended to the groin.

On the forty-third day it was observed that there was anesthesia over the external popliteal nerve distribution and also a complete footdrop. The result of the arterial suture was quite satisfactory at an early date, but the unfortunate paralysis of the external popliteal nerve caused great delay in recovery. This nerve lesion might have resulted from stretching or pressure by the clots or dressings or may have followed ischemia. Full motor and almost complete sensory function returned in six months.

In the History of the Great War (Medical Services) it is stated that gangrene of the lower leg occurred in 34.7 per cent of the wound cases and in 26.6 per cent of the cases in which ligation of the popliteal artery was done for other reasons. Even the lesions of the femoral artery have a better chance of escaping gangrene; the popliteal is known to be the most dangerous of all the limb vessels in respect to the risk of gangrene. ERNEST E. ARNHEIM, M.D.

Baker, E. C., and Sedwitz, S. H.: Observations on Venography of the Lower Extremities. *Radiology*, 1943, 41: 451.

Venography of the lower extremities was done in 130 cases during 1942. The authors believe this procedure to be of value in arriving at a correct diagnosis and determining proper therapy in disease conditions of the veins.

The technique of venography is as follows: 20 cc. of diodrast are injected slowly, over a two-minute period, into a small dorsal vein of the foot. Serial stereoscopic films are taken in rapid succession from the ankles to the pelvis. The procedure is accomplished by dividing the extremity into three parts (ankle and leg; leg, knee, and thigh; and thigh and pelvis), and by moving the x-ray tube and Bucky diaphragm up with each new exposure. Lead strips are placed on the table top with enough space between to allow for the extremity.

The normal venous anatomy is described. From ten to fifteen seconds after the injection, the dye will have spread to the superficial ankle veins and started to enter the deep circulation of the lower third of the leg. In from thirty to forty-five seconds the deep veins of the legs are filled and the veins of the lower femur are beginning to be filled. The progress of the dye in the thigh is rapid. The optimum time for x-ray exposure of the thigh is in from forty-five to ninety seconds.

In the presence of varicosities and late pregnancies the flow of venous blood is retarded. In the case of a thrombus or spasm the blood passes up the deep circulation to the point of obstruction, communicates by means of collateral veins to the superficial circulation, continues upward past the site of obstruction, and by means of collateral veins returns to the deep circulation.

In old or recent thrombophlebitis, there is a partial or total absence of dye in the deep circulation. In complete occlusion of a deep vessel, the circulation continues through the superficial system.

Venography is of value in demonstrating occlusions of the veins in cases in which the usual patency tests are normal. Then, too, the information gained from it is important as it suggests the type of surgical procedure that is to follow.

MAURICE D. SACHS, M.D.

DeBakey, M. E., Schroeder, G. F., and Oschsner, A.: Significance of Phlebography in Phlebothrombosis. *J. Am. M. Ass.*, 1943, 123: 738.

Phlebography is imperative in all cases of intravenous thrombosis in which the clot is not firmly attached to the vein wall—in phlebothrombosis. The procedure is simple, safe, and informative. Whenever a defect in the venous system is demonstrated in phlebothrombosis, immediate operation is imperative. This should consist of either ligation of the involved vein above the site of the thrombus or thrombectomy. Only by the prompt recognition of intravenous thrombosis and the institution of measures to prevent detachment of the clot can the mortality rate from pulmonary embolism be decreased. CHARLES BARON, M.D.

Shackelford, R. T., and Whitehill, R.: Successful Ligation of the Left Common Iliac Vein for Thrombophlebitis Complicated by Pulmonary Emboli. *Bull. Johns Hopkins Hosp.*, 1943, 73: 307.

The danger to life in thrombophlebitis arises from the development of pulmonary infarctions. Approximately 1 in 4 cases of pulmonary embolism is associated with clinical evidence of thrombophlebitis, and, similarly, approximately 1 in 4 cases of thrombophlebitis is associated with evidence of embolism. Of all patients who experience pulmonary emboli, approximately one-half have a single nonfatal embolus, one-quarter have a single fatal embolus, and the remaining one-quarter have multiple emboli, which in about 60 per cent of this group are followed by fatal embolism. Thus, there is real danger to the life of a patient with pulmonary infarction caused by an embolus from thrombophlebitis, and therapeutic measures, if reasonably successful, may justifiably be radical.

The use of heparin and dicoumarin can probably decrease these high mortality figures to some extent. Greater success, however, can be achieved by surgical procedures, which isolate the site of the embolus formation from the general circulation.

A case is reported in which an extensive thrombophlebitis developed; it involved the upper portion of the left femoral and internal saphenous veins, and

the whole of the left external and common iliac veins. The patient had had at least two episodes of pulmonary infarction. The left common iliac vein was ligated at its junction with the vena cava. There was almost no edema of the left leg prior to the operation, and no increase in the edema after it.

Ligation of a vein above the site of thrombophlebitis is the most effective procedure for the prevention of pulmonary infarction. It appears to be a more logical measure, also, than the administration of anticoagulants. However, the use of anticoagulants postoperatively, in patients known to be susceptible to the development of thrombophlebitis, may decrease the frequency of thrombophlebitis.

SAMUEL KAHN, M.D.

BLOOD; TRANSFUSION

Newman, B., and Gitlow, S.: Blood Studies in the Aged. The Leucocytes in the Aged Male and Female. *Am. J. M. Sc.*, 1943, 206: 622.

The present study is a sequel to one in which the authors reported findings regarding the various hematological constants of the erythrocytes in normal subjects past the age of sixty-five years. This study records the observations made upon a group of patients in the same age range, and reports the total and differential leucocyte counts.

Methods for securing these findings are described, and a tabulation is presented giving the average determinations of total leucocytes and differential blood counts according to age.

The total leucocyte counts and differential blood counts were made on a group of 50 normal, aged males and 50 normal, aged females. The females showed a statistically reliable difference in the total leucocyte counts from those of the males. The differential blood counts of the males and of the females showed no reliable differences. The values reported elsewhere for normal values in younger adults may be assumed to hold in the case of aged individuals.

Aged females, in general, have a total white blood-cell count that is slightly lower than that of aged males. The distribution of the various types of leucocytes in the peripheral blood of males is not materially different from that shown in females in the same age group.

Values for the total leucocyte counts for the males ranged from 5,000 to 12,050 per c.mm. (mean value, 8,330 cells per c.mm.), while for the females the maximum and minimum values for the total leucocyte counts were 11,100 and 5,050, respectively, (average 8,170 cells per c.mm.).

HERBERT F. THURSTON, M.D.

Paul, J. T., Limarzi, L. R., and Seed, L.: The Effect of Myxedema upon Hemopoiesis in Leucemia and Related Disorders. *Am. J. M. Sc.*, 1943, 206: 625.

The authors note that much has been written concerning the role of the thyroid gland in erythropoiesis. It has been shown that anemia is a frequent finding in myxedema. There is abundant evidence to indicate that the abolition of the thyroid gland depresses erythropoiesis. The reports of the effect of the thyroid gland on myelopoiesis and lymphopoiesis are scanty. It has therefore seemed advisable to investigate the effects of myxedema on hemopoiesis.

The cases studied included 2 of polycythemia vera, 3 of erythroleucemia, 2 of chronic myeloid leucemia, and 2 of chronic lymphatic leucemia. A complete hematological survey, including sternal bone-marrow examination, was made in each case prior to and after removal of the thyroid gland.

Other extensive laboratory examinations were made and the findings are recorded. All thyroidectomies were performed by the same surgeon. After operation the patients were allowed to develop a myxedematous state as demonstrated by dry, coarse skin, puffiness, heat intolerance, depressed basal metabolic rate, and elevated blood cholesterol.

The authors concluded that erythropoiesis is depressed in polycythemia vera after a total thyroidectomy and development of myxedema. The anemia is macrocytic and hyperchromic in type. Leucopoiesis is unaffected.

In erythroleucemia, myxedema induced a moderate to marked depression in erythropoiesis. The anemia is macrocytic or microcytic in type. There is a stimulation of leucopoiesis. In 1 case, after thyroidectomy, there was an early "megakaryocytic crisis" followed later by normal platelet counts.

Hemopoiesis in chronic lymphatic and chronic myeloid leucemia is not altered by an induced myxedema.

HERBERT F. THURSTON, M.D.

Amidon, E. L.: The Reaction of Leucemic Patients to the Sulfonamides. *J. Lab. Clin. M.*, 1943, 28: 1691.

Knowledge of the effectiveness of the sulfonamides on certain infectious diseases is rapidly becoming definite and accurate. Much experimental evidence has accumulated concerning the toxic effects of the drug. In this report the author considers only the toxic effect on the white blood cells. Livingston and Moore demonstrated the effect of sulfapyridine on the white cells of patients with leucemia. They administered sulfapyridine to 6 patients with lymphatic leucemia and reported a definite and marked change in the total number of lymphocytes in the peripheral blood. The author reports a study of the cases of 4 patients with lymphatic leucemia to whom sulfonamides were given. A detailed report of each case is presented.

It appears that certain of the sulfonamides may produce a rather sudden drop of lymphocytes in lymphatic leucemia. This does not occur in myelogenous leucemia. That this reaction is not of a toxic nature is best indicated by the suddenness of the response and by the fact that there is usually an improvement in the patient's condition.

The suggestion that sulfanilamide may interfere with some growth factor inhibiting the development of bacteria is worthy of consideration. Is it possible

that the drug, acting in a similar manner, inhibits the multiplication of lymphocytes? If this is so, it is peculiar that similar results do not occur in myelogenous leucemia, and that sulfadiazine failed to produce similar results.

Of the 4 cases of leucemia presented by the author, all showed a drop in the total circulating lymphocytes, and all but 1 presented clinical improvement, after the administration of sulfanilamide and sulfathiazole.

HERBERT F. THURSTON, M.D.

Motlis, J., and Guash, J.: Prothrombinemia and Vitamin K In 106 Patients with Chronic Pulmonary Tuberculosis (Protrombinemia y vitamina K en 106 tuberculosos pulmonares cronicos). *Rev. méd. Chile*, 1943, 71: 871.

The authors determined the prothrombin time in 106 patients with chronic pulmonary tuberculosis, using a modification of Quick's technique.

In 30 per cent of the patients a diminution of the prothrombin concentration in the blood was found. Less than 50 per cent of the normal amount was present in 6.58 per cent of the patients. There was no apparent relation between the prothrombin level and the gravity of the pulmonary condition. Patients with hemoptysis did not show a greater tendency to hypoprothrombinemia than other tuberculous patients.

Of the 106 patients studied, 39 were suffering from hemoptysis and 20 showed signs of secondary intestinal tuberculosis. Thirty-two patients had changes in the prothrombin time and 19 of these had advanced tuberculosis. The intravenous administration of vitamin K had no apparent favorable effect on hemoptysis and did not raise the prothrombin content of the blood. This failure is attributed by the authors to a poor general condition of the patients.

Hypoprothrombinemia as such does not appear to be an important factor in the provocation of hemoptysis and, inasmuch as physiological fluctuations of the prothrombin level in the blood may be considerable, the usefulness of vitamin K in the treatment of hemoptysis is very limited.

Intestinal tuberculosis cannot be considered an important factor in the production of hypoprothrombinemia.

No relation could be established between the prothrombin level in the blood and the parenchymatous changes in the liver, especially the fatty degeneration found at autopsies. This may be due to the fact that liver functions are greatly independent of anatomic changes in that organ.

JOSEPH K. NARAT, M.D.

Shen, S. C., Ham, T. H., and Fleming, E. M.: Studies on the Destruction of Red Blood Cells. *N. England J. M.*, 1943, 229: 701.

Hemoglobinuria, the excretion of extracellular hemoglobin in the urine, is recognized as an early complication of severe thermal burns. It is a sign of rapid destruction of red blood cells with the production of free hemoglobin in the plasma, which is usually excreted promptly by the kidney.

In this article, the authors have reported their observations on the changes in the blood and in the urine, and on the kidney complications occurring in 14 patients with moderate or severe thermal burns, 10 of whom showed hemoglobinuria. A detailed tabulation of these observations is presented. Gross hemoglobinuria was observed in 9 cases, and minimal hemoglobinuria in 2 among 40 cases of combined second-degree and third-degree thermal burns involving from 15 to 65 per cent of the body area. The maximum excretion of hemoglobin occurred during the first twelve to twenty-four hours, and then decreased rapidly.

The urine samples from patients with gross hemoglobinuria were scanty in amount for one or two days, varied from black to red to light brown, had an acid reaction (pH 4.5 to 5.8), and contained hemoglobin in solution, in precipitated form and in casts. The red and brown pigments were identified spectroscopically as oxyhemoglobin mixed with traces of methemoglobin. There was no evidence of myohemoglobin.

The plasma or serum from 8 cases showed hemoglobinemia. Spectroscopically, oxyhemoglobin and methemalbumin were detected in the serum from one patient. Chronic azotemia of moderate severity occurred in spite of the re-establishment of adequate excretion of urine in 4 of 5 patients with hemoglobinuria who lived five days or longer. In 6 patients with hemoglobinuria, examined post mortem, the histology of the kidneys was consistent with hemoglobinuria in each case. It is suggested that the immediate treatment of severely burned patients should attempt to establish diuresis of alkaline urine.

No significant anemia developed in the first twenty-four to forty-eight hours in the 14 burned patients, of whom 10 showed hemoglobinuria.

If blood is rapidly heated to a temperature of from 51° to 65° C., changes occur in the red cells, consisting of fragmentation and the formation of spherocytes and microspherocytes, with a striking increase in osmotic fragility and hemolysis of the erythrocytes.

In patients with severe or moderately severe thermal burns, the red cells, which were examined immediately after the burn, exhibited changes in morphology and osmotic fragility similar to those obtained by the injection into dogs of the animals' own erythrocytes heated in vitro to about 53° C.

The increased osmotic fragility of heated red cells apparently results from conversion of the normal biconcave erythrocytes to more nearly spherical forms by a process of progressive fragmentation. The mechanism by which heat causes fragmentation of red cells is not defined. It is possible that destruction of the red cells with increased osmotic fragility in vitro occurred through a mechanism of swelling and osmotic hemolysis in the isotonic plasma of the animal.

In thermal burns a significant number of erythrocytes may be destroyed by heat, probably in accord

with the temperature attained by the blood, the duration of heating, and the volume of blood subjected to these conditions.

HERBERT F. THURSTON, M.D.

Ross, J. F., and Chapin, M. A.: Effect of Storage of Citrated Blood on the Survival of Transfused Erythrocytes. *J. Am. M. Ass.*, 1943, 123: 827.

The radioactive isotope of iron is metabolized by the human organism exactly as ordinary iron, and when fed to or injected into persons it is incorporated into the hemoglobin of newly formed erythrocytes. Once built into the hemoglobin molecule of an erythrocyte, radioactive iron does not exchange with the iron of the serum or the tissues, but remains within the red blood cell during its entire lifetime. Radioactivity does not influence the function of the erythrocyte in any way but serves to "tag" the cell during its lifetime. The technique is so sensitive that 0.0005 cc. of transfused radioactive cells can be detected in 1.0 cc. of the recipient's blood with an accuracy of ±10 per cent.

From these studies it appears that the breakdown products of hemoglobin are rapidly re-utilized for the synthesis of new hemoglobin. This indicates that even though transfused cells are rapidly destroyed they are of distinct therapeutic value in promoting blood formation.

Storage of citrated blood exerts a deleterious effect on erythrocytes. When continued for six days, only 50 per cent of the transfused cells survived for twenty-four hours, and when storage was prolonged for ten days or longer, less than 10 per cent of the cells survived for twenty-four hours. These observations corroborate the findings of other investigators that citrated blood is unsatisfactory for blood transfusion when it is stored for more than two or three days.

GEORGE A. COLLETT, M.D.

Graydon, J. J., and Woods, E. F.: Group-Specific Substances in Pooled Human Serum. *Med. J. Australia*, 1943, 2: 413.

The injection of serum containing incompatible isoagglutinins is now generally accepted as safe. By the inclusion of serum of different groups in each batch, the titer of isoagglutinins can be reduced to a safe level by absorption and dilution. It seems desirable that the component sera for each pooled batch shall be preselected so that a high and balanced proportion of serum-containing receptors is included. A suitable ratio for large pools is one serum of groups B and AB to every four sera of group O or A. Donors whose serum contains isoagglutinins of exceptionally high titer should be reserved for other purposes.

HAROLD C. OCHSNER, M.D.

Strumia, M. M., McGraw, J. J., and Blake, A.: Reactions to Parenteral Fluid Administration. *Ann. Int. M.*, 1943, 19: 718.

This article reviews briefly the reactions to intravenously administered fluids in general, such as whole blood, plasma, human serum, and crystalloid solutions. It deals particularly with the question of reactions to plasma, since this material is now widely used and lately its role as an actual or potential source of reactions has been a controversial point.

The causes of reactions may be inherent in the fluid administered or they may be conditions (physiological or pathological) which are peculiar to the recipient or to a combination of these two factors.

Some of the elements causing reactions, such as pyrogens, may be found in all of the fluids mentioned, whereas others are present or prevail only in certain fluids. Thus, hemolytic reactions have been reported practically only when erythrocytes have been administered. Often, reactions are traced not to the fluid itself, but to improperly cleaned equipment used to prepare or administer the fluid. This is true particularly of pyrogenic reactions.

The most common reactions due to causative elements inherent in the fluid alone may be classified as pyrogenic, nitritoid, embolic, or mechanical (from speed of administration). Reactions due to inherent qualities of the fluid combined with conditions of the patient may be listed as hemolytic and allergic. Conditions inherent in the recipient alone which increase the incidence of reactions may be listed as hyperhemolysis, liver disease, hypoproteinemia, and cardiac insufficiency. Free hemoglobin, potassium content, temperature, and air embolism are elements often mentioned as potential or actual causes of reactions, and are also briefly discussed. The hemolytic reactions following whole-blood transfusion are commented upon.

Pyrogenic reactions are by far the most common and may occur after the intravenous administration of any fluid which has been improperly prepared, or administered with improperly prepared apparatus. Pyrogens are usually the product of bacterial growth and disintegration of bacterial bodies. There is no satisfactory treatment of pyrogenic reactions, except symptomatic. Therefore, the remedy is prevention. In patients with a febrile temperature, especially if of the septic type, it is desirable, whenever possible, to administer the intravenous fluids at a time when the temperature is at its expected low, usually in the morning.

Nitritoid reactions have been observed after the administration of whole blood but are more common after the administration of freshly prepared serum or fresh serum which has been kept in the frozen state or dried from the frozen state. It has not been observed after the administration of crystalloid solutions. Usually the reaction immediately follows the administration of the fluid; in fact, it often occurs during the administration. The reaction consists of a sense of constriction of the chest, often very alarming; and pain over the lumbar region, sometimes, but not always, followed by chill and/or rise of temperature and occasionally by nausea, vomiting, and headache. The reaction is usually over after a few hours (four to five) and appears to cause no permanent damage. The authors report a case recently observed, through the courtesy of Dr.

Angelucci and Dr. Minot, of a patient who had severe reactions of the type here described following the administration of fresh whole citrated blood, and of dried pooled commercial plasma.

Embolic reactions are not encountered in the administration of crystalloid solutions. These solutions should not be filtered through paper or gauze, but through a sintered or fritted (glass) filter before sterilization. They need not be filtered again before administration. Whole blood should always be filtered immediately before administration. This is particularly important in the case of blood preserved at refrigerator temperature for a period of time because of the rapid and progressive formation of numerous fine, soft flocculi. Plasma and serum should always be filtered at the time of preparation, preferably at the time of pooling. If properly preserved thereafter, they need not, strictly speaking, be filtered before administration, although if doubt exists filtration is necessary.

Concerning the speed of intravenous administration of fluids, it is safe to state, from practical experience and from the experimental work of Altschule *et al*, that if the concentration is isotonic, a rate up to 20 cc. per minute is perfectly safe and well tolerated. In at least 2 cases of transfusion of incompatible blood, in the authors' experience, fatal reactions were avoided probably because the rate of transfusion was slow and symptoms developed when only a relatively small amount of blood had been administered. This allowed the transfusion to be stopped in time to avoid more serious damage.

In this article a hemolytic reaction refers to the syndrome which follows the transfusion of incompatible blood. Blood is incompatible if the recipient's plasma agglutinates the donor's cells. Hemolytic reactions are comparatively rare, but, because they are often fatal, it is important to take every precaution to avoid them. By far the great majority follow the transfusion of whole blood into recipients whose plasma agglutinates the donor's cells.

The typical hemolytic reaction starts during or very shortly after the transfusion. It commonly manifests itself with a chill, often followed by fever, nausea, vomiting, pain in the lumbar region, and a sense of constriction in the chest. There may be abdominal cramps, pain over the bladder, and an urge to defecate. Transient hemoglobinemia with passage of scanty reddish-brown urine is followed within five hours by hyperbilirubinemia, and shortly after by jaundice. The peak is usually reached within twenty-four hours. The oliguria may improve and the patient rapidly recover, but more often azotemia follows. This may lead to uremia and death or, after a period of several days when the issue is in doubt, the flow of urine may increase and recovery follow.

The prognosis in any given case is somewhat difficult to determine. In general, in patients suffering from previous kidney damage or from any other serious illness, the outlook is unfavorable. The amount of blood administered seems to bear some relation to the end-result. Most patients receiving 250 cc. or less will recover from their first hemolytic transfusion reaction. Those receiving 500 cc. and those who have had previous transfusion reactions will usually die.

In view of the lack of any satisfactory treatment, it is absolutely essential to take every precaution to prevent hemolytic reactions. These precautions include a careful blood grouping of the recipient and the donor, careful crossmatching tests, and adequate studies regarding the anti-Rh and other less common isoagglutinins, particularly in pregnant or puerperal women and in persons receiving repeated transfusions. In addition, the transfusion should be given slowly so that it may be stopped early in the event of a reaction. Unfortunately, in some patients the transfusion of incompatible blood is not followed by immediate reaction, and the first signs are the passage of dark-colored urines and jaundice, followed by oliguria or anuria.

Women who are about to be delivered and who have had babies suffering with erythroblastosis and related syndromes, or who have just been delivered of such babies, will often show abnormal isoagglutinins which may be the cause of serious or fatal reactions unless special precautions are taken in the preparation for transfusion. For this reason all Rh-negative pregnant or recently pregnant women should preferably receive Rh-negative blood of their proper group since the anti-Rh agglutinins may not be detectable in all instances even though the crossmatching is done at 37°C. and is followed by centrifugation and examination.

Allergic reactions are usually attributed to substances of alimentary origin contained in the whole blood, plasma, or serum to which the recipient is sensitive. They generally consist of localized urticaria with no systemic reaction. It is impossible to eliminate completely these reactions which occur in from 0.3 to 1 per cent of transfusions. One way to reduce them is to insist that the blood be obtained from the donor in a fasting condition.

The occurrence of jaundice has been reported following the administration of certain yellow-fever vaccines containing some human serum, and the intravenous administration of human serum and of human whole blood and plasma. The incubation period appears to be from one to four months. Until more is known on this subject, it seems reasonable to presume that the icterogenic properties of blood and blood derivatives are due to a recent infection of the donor. In view of this, it appears reasonable to recommend that all prospective blood donors should be carefully questioned concerning a history of previous jaundice or contact with jaundice cases. A history of recent jaundice (within six months) or contact with such a case should disqualify a donor for blood transfusion.

The administration of well matched whole blood to patients suffering from hyperhemolysis from all sources, but particularly to patients with hemolytic anemia, is likely to cause a hemolytic crisis, as

pointed out by Greppi and Sharpe and Davis. In the icterus-gravis neonatorum, extreme care must be exercised and the use of whole blood reserved for cases of extremely severe anemia. The conditions of shock and edema are effectively treated with plasma.

In severe liver damage, particularly if associated with jaundice, and in hypoproteinemias, reactions to whole-blood transfusion are more common than in the average case. Administration of whole blood should, in these cases, be done at a very slow rate. Whenever there is no severe anemia, plasma should be used in place of whole blood.

The intravenous administration of fluids, particularly of those with a high viscosity, such as whole blood, must be done very slowly in all patients with cardiac decompensation. With a rate not exceeding 5 cc. per minute the danger of overburdening the heart is reasonably reduced to a minimum.

Other elements to be considered as possible causes of reactions include the administration of small amounts of hemolyzed blood, such as contained in properly preserved blood, which is considered harmless. As a matter of fact, the intravenous administration of large quantities of crystallized or at least purified hemoglobin has been accomplished without apparent damage. Likewise, the danger from administration of small quantities of air trapped in tubing, connections, and needles has probably been unduly emphasized; however, it should be carefully avoided.

The intravenous administration of even large quantities of cold fluids does not cause reactions. However, in view of the fact that severe reactions may follow the administration of whole blood, plasma, or serum which has been heated excessively, it is desirable to eliminate entirely the practice of warming transfusion fluids prior to administration.

In conclusion, there are some general precautions that greatly assist in reducing the rate of reaction to intravenous fluid therapy:

1. The preparation of crystalloid solution; the collection of blood; the preparation, preservation, and administration of plasma; and the cleaning, assembly, and sterilization of apparatus for intravenous fluid administration must be under a single centralized supervision, usually in connection with the clinical laboratory, to secure proper standardization and control of each step.

2. A regular system must be instituted for the reporting in detail of all reactions occurring so that critical scrutiny of each case will allow improvement of the service. JOHN E. KIRKPATRICK, M.D.

Kouky, R. W.: Experiences with the Rh Substance in Transfusion Reactions. *Minnesota M.*, 1943, 26: 980.

The knowledge of the Rh substance made available by the studies of Landsteiner, Levine, Wiener, and others, has contributed materially to the identification and prevention of transfusion reactions. These new data should rightfully be received with enthusiasm, but at the same time they should not obscure in any way the many lessons previously learned regarding the successful management of blood transfusions.

Two cases are cited to illustrate the general character of the reactions due to Rh sensitization. They occur in spite of the use of compatible blood groups, and they occur after a prior transfusion or during pregnancy.

Human blood contains many specific substances, of which only a few are of interest to physicians. The A and B substances are well known since they are responsible for the division of blood into the four blood groups: AB, A, B, and O (Moss groups 1, 2, 3 and 4, respectively). The M and N substances are useful in medicolegal problems and very rarely are involved as a cause of transfusion reactions. Until recently, the Rh substance had no clinical application for the reason that, like most of the other specific blood substances, it was unknown to physicians.

Approximately 85 per cent of individuals possess this Rh substance as a normal constituent of their red blood cells. This group is spoken of as Rh positive. Fifteen per cent of the people do not have this substance and this group is known as Rh negative.

The Rh substance can be introduced into the Rh negative individual in two ways: by transfusion of Rh positive blood or by a pregnancy in which the fetus is Rh positive. Rh negative patients transfused with Rh positive blood have no reaction from the first transfusion, but if they are again transfused with Rh positive blood after they have formed antibodies, they develop a reaction. An Rh negative woman who bears an Rh positive fetus may become sensitized during the pregnancy and if she is transfused with Rh positive blood she will develop a reaction during the first transfusion. The Rh positive child born of such a sensitized mother has the syndrome known as erythroblastosis.

The general incidence of erythroblastosis likewise indicates that only a few Rh negative women exposed to the Rh substance during pregnancy are affected by the exposure. In the general population the theoretical occurrence of an Rh negative mother bearing an Rh positive child is about 9 per cent. However, the incidence of erythroblastosis, which can be taken as a gauge of the frequency of significant sensitization, is probably not over 0.5 per cent.

The Rh agglutinin is slow-acting and produces its effect best at body temperature. It is this slow activity and need for incubation which prevents the demonstration of these agglutinins in the usual open-slide method of examination. A special technique has been devised by Levine and is described briefly.

The cross-matching of the patient's serum with the donor's cells is done in the same manner. The tendency of cells to agglutinate varies greatly and often a weak serum will agglutinate only one of many cell suspensions. In checking a patient's serum for antibodies it is necessary to cross-match against as many suspensions of group compatible cells as

possible. If even one strain of cells is agglutinated the presence of Rh agglutinins is almost certain.

There is another property of the Rh antibody which is either identical with or related to the characteristic just described. A given strain of serum may yield a negative, or faintly positive, reaction with some cells and yet another serum, apparently of equal potency, may give a positive reaction. Before individuals are finally classified as Rh negative, the cells should be checked against several strains of serum. At least the two available commercial strains should be on hand in every laboratory.

Transfusions to women during their pregnancy or puerperium must be governed by the following considerations. Except in extreme emergencies no woman who is pregnant, or recently delivered, should be given whole blood until her Rh status has been determined. In almost all emergencies plasma or serum can be given until the Rh tests can be prepared. This applies even in cases of early abortions, but probably not in the usual ectopic pregnancy. If the woman is proved to be Rh positive, transfusions of any group compatible blood can be given and the question of Rh sensitization can be dismissed. If the woman is Rh negative and if the baby has died or is abnormal in any way, the possibility of erythroblastosis is very great and it is almost imperative that Rh negative donors be used.

Sometimes no Rh negative donors can be found. In such cases the biological test proposed by Wiener, Silverman, and Aronson may be carried out. This test consists of the intravenous injection of 50 cc. of the prospective donor's blood with a determination of the icteric index before and one hour after the injection. If no hemolysis occurs as demonstrated by an elevation of the icterus, a second 50 cc. should be given if time allows. The icterus should be determined one hour after this second injection. If no elevation of the icterus occurs, the remainder of the transfusion can be given. The test is new, and more experience with its use is necessary.

The persistence of Rh antibodies for months or years after a pregnancy presents another problem. Such sensitized women would suffer a reaction, if a transfusion of Rh positive blood should be given for anemia, shock, or blood loss. Rh negative donors should be used if they are available.

Transfusions to infants differ in no essential manner from those to adults. In the case of the baby with erythroblastosis, certain features complicate the situation. These babies have been exposed to maternal Rh antibodies which have become fixed to the child's tissues. Transfusion of the mother's blood adds more antibodies to the infant and aggravates the child's condition.

Levine stated that Rh negative blood should be used for transfusing erythroblastotic babies. This is impractical in many cases. Theoretically, Rh positive blood will help in destroying the maternal antibody fixed to the infant's tissues. The entire question of which Rh type of blood to use for erythroblastotic babies needs more study. However, in the meantime, the condition of the child should never be endangered by delays attending a search for Rh negative donors. The majority of erythroblastotic babies have been treated with Rh positive blood with excellent results.

JOHN E. KIRKPATRICK, M.D.

RETICULOENDOTHELIAL SYSTEM

Evans, H., and Perry, K. M. A.: Thrombocytopenic Purpura. *Lancet*, Lond., 1943, 245: 410.

Of 75 cases of thrombocytopenic purpura treated at the London Hospital, 30 occurred before and 45 occurred after puberty, the patients being equally divided between the two sexes in the first group, while in the second group there was a preponderance of 5 females to 1 male.

As to the etiology of this disease, Pohle has shown that the number of platelets in normal women falls slowly and progressively during the fourteen days before menstruation and rises rapidly soon after its onset. On the basis of this and other clinical observations, the authors believe in the endocrine origin of thrombocytopenic purpura. One patient of their series showed marked improvement during pregnancy, and then the symptoms reappeared after delivery and the platelet count returned to its former low level. This, however, is not a constant finding in pregnancy complicating thrombocytopenic purpura.

To be noted is the high incidence of thyrotoxicosis in women with thrombocytopenic purpura who are more than forty years of age (3 cases in 17).

Bomford and Rhoads recently pointed out the frequent association of refractory anemias with endocrine disturbances. On the other hand, the strict relations between thrombocytopenic purpura and refractory anemias are well known. It is possible that the same mechanism, in different degree, is the cause of both diseases, and in females it may possibly be only an exaggeration of the physiological process.

Splenectomy may be a life-saving measure and is sometimes advisable to prevent subdural hemorrhage which represents the more common cause of death. In this series splenectomy was successful in 7 of 7 males and 7 of 17 females, with 3 operative deaths.

In conclusion, the mortality was found to be much lower before than after puberty, and splenectomy was more successful in males than in females.

CONRAD L. PIRANI, M.D.

LYMPH GLANDS AND LYMPHATIC VESSELS

Crandall, L. A., Barker, S. B., and Graham, D. G.: A Study of the Lymph Flow from a Patient with a Thoracic-Duct Fistula. *Gastroenterology*, 1943, 1: 1040.

The author had the opportunity to study the lymph from a patient in whom the thoracic duct was severed by a bullet, and in whom it seemed probable that all of the lymph which normally returns to the subclavian vein was for a time lost through a fistula in the neck.

Although lymph flowed freely from the wound and saturated the dressings, attempts to collect it by suction on a catheter placed deeply enough so that it was thought to be in the neighborhood of the subclavian vein were without success. until a solution of 5 ml. of heparin (liquaemin) in 1 liter of 0.9 per cent saline solution was dripped into the wound by means of a small catheter placed as deeply as possible. The rate of flow of the heparin solution varied from 8 to 20 drops per minute, as determined by the insertion of a Murphy drip tube between the heparin flask and the catheter.

The lymph mixed with heparin was collected from the external opening of the wound through a larger catheter connected with an Erlenmeyer flask to which gentle suction was applied. The rate of flow of the heparin solution was measured at fifteen-minute intervals, sometimes more frequently. Since the rate of flow of the heparin solution was known, the rate of lymph flow could be determined by subtracting the volume of heparin solution from the total fluid collected over a known interval. The tables show that lymph flows obtained by this method were reasonably constant over long periods of time. Water given by mouth appeared to increase the flow slightly Magnesium sulfate was given, and it was noted that the flow decreased, rather than increased, in spite of the fact that an additional 200 ml. of water were allowed at the patient's request within the hour following magnesium sulfate administration. In one hour and forty-five minutes after the magnesium sulfate was given the lymph flow had fallen to less than half of the control value.

A meal, the usual hospital Sunday dinner, was eaten and the rate of lymph flow was increased about three times immediately after the meal. Abdominal massage was then given for five minutes, and was accompanied by an increase of about 40 per cent in lymph flow, followed by a return to control levels as soon as the massage was stopped. Morphine sulfate was injected because this drug is known to increase the nonpropulsive motility of the intestine and would tend to promote relaxation of the skeletal musculature. For the first half hour after the morphine was given there was little change in flow; then the patient became drowsy and fell asleep. During the thirty minutes that she was allowed to sleep the lymph flow fell to less than half the control rate, but this was not lower than the rate observed toward the end of the previous day's study when she was very restless. Lymph proteins were determined, and it was observed that the protein content of the lymph increased by a little less than 10 per cent following the meal; however, this change is probably not significant.

The authors can find no report in the literature of the collection of lymph from a thoracic-duct fistula in man since that of Sollman in 1907. Prior to Sollmann's observations, Hensen in 1875, Paton in 1893, and Munk and Rosenstein in 1894 had each reported cases from which they collected thoracic-duct lymph.

In contrast to these patients with thoracic-duct fistulas previously reported, the authors' patient was essentially normal, and the conditions of collection were such that relatively constant rates of flow were obtained.

It is most unfortunate that the authors were not able to establish by more rigid criteria the completeness of the fistula. The absence of lipemia following a fat meal, the loss of weight, and the low plasma protein observed after the fistula had become well established, and the gain in weight and general improvement following ligation of the duct all indicate that at least the greater part of the lymph passing into the thoracic duct was being lost through the wound. The abdominal distress experienced for two weeks after ligation of the thoracic duct also suggests that a collateral circulation was not readily available but was forced to develop only after increased pressure necessitated the formation of some avenue for escape of the lymph.

The rate of flow of the lymph was much more constant than in the case of any similar patient described previously, probably because of the technique used. The basal rate of flow averaged 0.93 ml. per minute or 1.38 ml. per kgm. of body weight per hour. An increased rate of flow was produced by food, by water, and by abdominal massage. The maximum flow observed was 3.9 ml. per minute, the minimum 0.38 ml. The protein content of the fluid varied from 3.19 to 5.28 gm. per cent, which compares favorably with values reported for dogs. Olive oil stained with Sudan IV appeared at the fistula one hour and twenty-seven minutes after its administration by mouth. JOHN E. KIRKPATRICK, M.D.

Gall, Major E. A.: The Surgical Treatment of Malignant Lymphoma. *Ann. Surg.*, 1943, 118: 1064.

This study is concerned with 48 cases of malignant lymphoma of all types, with sufficient localization to permit surgical excision.

These cases have been classified into the following seven groups: stem-cell lymphoma; clasmatocytic lymphoma; lymphoblastic lymphoma; lymphocytic lymphoma; Hodgkin's lymphoma; Hodgkin's sarcoma; and follicular lymphoma. For purposes of comparison with other systems of nomenclature it may be said that the stem-cell and clasmatocytic groups probably together comprise the bulk of the tumors commonly included under the term "reticulum-cell sarcoma." The lymphoblastic and lymphocytic types correspond to what has usually been called lymphosarcoma. Follicular lymphoma has been named giant follicle lymphoblastoma, and even giant lymph-follicle hyperplasia. The expression, cellular Hodgkin's disease, is roughly equivalent to Hodgkin's sarcoma, and many authors undoubtedly include these cases as variants of reticulum-cell sarcoma.

The cases include representatives of each of the subgroups with a predominance (27 of 48) of the four malignant types. In spite of this apparently unfavorable distribution, the median survival period of the group as a whole was four and one-half years,

more than twice that of the large control series in which the majority of cases were treated by roentgen therapy alone. In the stem-cell and clasmatocytic groups (20 cases), the median survival periods were nearly five times as long as in the control series, and in the lymphocytic and Hodgkin's lymphomas (18 cases), nearly twice as long.

The average age at onset was forty-one and one-tenth years, and the proportion of males to females was 2 to 1.

There was a wide variation in the duration of symptoms preceding operation, which ranged from a few days to five years. The average preoperative duration of symptoms was one year, the mean, one-half year. In the larger series of miscellaneously treated cases the average pretreatment period was one and three-tenths years. It does not appear, therefore, that the patients included in the present study received therapeutic attention significantly earlier than the general run of individuals with the same disease. The preoperative duration of symptoms bore no relationship to postoperative survival.

None of the patients received preoperative roentgen therapy, which is not surprising since the histological nature of the lesion was unsuspected in almost all instances. Postoperative prophylactic irradiation was administered to 21 patients in amounts varying from 600 to 1,800 roentgens. The results were inconclusive. Thirteen other patients received irradiation at a later time for recurrence of the original tumor. The response in these individuals was satisfactory in 8 instances.

Six of the 48 patients were considered lost, although 3 remained under observation after operation for 2.6 years, 3.5 years, and 8 years, respectively. Twenty-three patients were known to be dead, but among these were several who died of causes unrelated to lymphoma. Nineteen patients were alive, and only 1 of these had shown evidence of lymph-node disease at the last examination. All of the others had been free of symptoms or objective signs for three or more years.

Recurrence, either local or elsewhere, was observed in 23 patients. The recurrence had appeared after an average of two and two-tenths years, although in 8 patients there had been an interval of from three to seven years. Among the 23 patients who died, there were 13 with recognizable lymphomatous lesions at the time of death, in 4 of whom the cause of death was unknown, and in 6 of whom no evidence of lymphoma was found. The latter included the cases of 5 patients who died shortly after operation, the deaths being presumably surgical in nature.

Six of the cases were subjected to autopsy. In 4 (0.2, 0.25, 2.5 and 10 years after operation), extensive lymphomatous infiltration was found.

Exclusive of the 2 patients who disappeared immediately after discharge from the hospital, the average postoperative survival for all cases was 5.2 years and the overall total duration from the date of onset was 6.9 years. These figures are, respectively, two times and almost three times the levels of similar figures obtained from identical cases treated by other means.

Of 20 "cured" patients, 18 are still alive; 1 died, without evidence of lymphoma at autopsy, four and one-half years after the excision of the primary process; and 1 was lost from observation eight years after operation. Five of the patients had had a local recurrence. Of these, 2 were treated by secondary excision, and 3 by irradiation. They had no further evidence of their disease after 3.0, 6.0, 8.8, 9.5, and 14.8 years from the time of the secondary procedure. The average postoperative survival for this group of 20 cases is eight years, and both the average and mean total duration is nine years.

The author concludes that in cases of malignant lymphoma which are sufficiently localized and accessible radical surgery may produce far better results than can be anticipated from roentgen therapy alone.

ERNEST E. ARNHEIM, M.D.

SURGICAL TECHNIQUE

WAR SURGERY

Ackland, T. H.: The Reception of Wounded at an Operating Section: Problems of Organization, Resuscitation, and Immediate Disposal. *Med. J. Australia*, 1943, 2: 418.

The author states that a surgeon can handle not more than 10 major casualties in twelve hours: these include patients for amputation, laparotomy, craniotomy, or ligation of a major vessel. The number may be increased to a maximum of 15 if a few less seriously wounded are included. In the Sanananda battle, when 100 casualties arrived at an operating station within a few hours, 5 surgeons were found to be necessary to avoid delay in operating, and a high standard of treatment was achieved. If a single surgeon operates continuously for twenty-four hours, he will be brought to exhaustion and uselessness at the end of forty-eight hours. When 2 surgeons are available, twelve-hour shifts may be arranged, and the result should be an unlimited period of functioning, barring malaria and dysentery.

A large space is required near the operating theaters for admission and resuscitation. The stretchers must be supported at a height convenient for examination and treatment. X-ray units have not been used at forward surgical stations in jungle warfare, but occasions may arise in the future when they will be used by some operating teams. If this is the case, the x-ray tent must be close to both the operating theater and the resuscitation areas. At Tobruk it was found that when 3 surgeons were working simultaneously, the rate of passage of patients through the fluoroscopic room usually corresponded to the rate of passage through the operating theaters. Thus patients coming from x-ray examination could be taken directly for operation, without being taken back to the admission room.

The officer in charge of the admission room should be the most experienced surgeon available. The maximum degree of improvement may appear insufficient for the operative procedure which is to be undertaken, but when this degree of improvement has been attained, it must be recognized immediately, and operation performed at once. The importance of a complete examination of the body cannot be overemphasized. The smallest entry wounds on the chest or abdomen, which at first sight appear superficial and insignificant, may be associated with severe visceral damage. This is true especially of bomb, shell, and mortar splinters. When a group of casualties has been examined, the patients must be classified in their order for operation.

"Sucking" chest wounds will probably have been satisfactorily sutured at a regimental aid post. Loss of blood through a small chest wound may in itself be serious, and, apart from "sucking," is an indication for suture.

Perforation of the intestine is usually made manifest by generalized tenderness and pronounced rigidity of the abdomen. An extensive hemoperitoneum is nearly always present. Four types of wounds difficult of diagnosis are frequently encountered: (1) penetrating or perforating wound over the right lower ribs; the wise course is to perform a laparotomy by means of a Kocher incision extending well into the loin; (2) wounds of the loin; in all cases of doubt, careful exploration should be carried out; (3) tangential wound of the abdominal wall; full exposure at operation is required; and (4) wounds of the buttocks and pelvis; in all cases of doubt, the abdomen must be opened.

In the case of head wounds, the admission officer must be able to select for operation only those casualties who are likely to benefit from operation. In "rush" periods, only conscious or partly conscious head-wound casualties should be sent to the operating theaters. Blood transfusion is seldom required for head-injury casualties. Morphine is best avoided or at least administered sparingly.

Wounds of the buttocks may be associated with: (1) perforations of the small intestine, with or without damage to the rectum or sigmoid; (2) intraperitoneal or extraperitoneal wounds of the bladder; (3) wounding of the rectum; (4) intraperitoneal or extraperitoneal rupture of the urethra: (5) fracture of the neck of the femur; (6) sciatic nerve lesion; (7) cauda equina lesion. Even when the buttock wound involves only gluteal muscles, bold excision is required to avoid sepsis.

In limb wounds it is unbelievably common to find that tourniquets are not functioning: this is true particularly around the thigh. The complications of such wounds are presented in some detail.

HAROLD C. OCHSNER, M.D.

Devine, J.: A Note on Desert Sores. *Med. J. Australia*, 1943, 2: 261.

Three types of tropical ulcers were noted at the siege of Tobruk. In the typical or textbook type a small blister would appear and then break down to form an ulcer. This type was rare. The second was a common type following trauma. A scratch or abrasion would break down to form an ulcer which showed no tendency to heal. The third type followed a skin infection, usually a boil.

No one organism could be proved to be the cause of desert sores, nor could dietetic deficiency be established as the cause. Flies were scarce at Tobruk because of the efforts of the hygiene sections but desert sores were rife. The author observed that transport drivers and underground clerical workers who had no sensible sweating showed a lack of sores, whereas most of the patients were from the field bakeries where the heat was unendurable. It is suggested that an important factor perpetuating the minor

traumatic lesions which caused the majority of desert sores was their being bathed in an irritating solution of concentrated sweat.

From a study of the results of treatment in 200 cases of early desert sores it appeared that the results were the same whether sulfanilamide was employed or not, although its efficacy in chronic cases could not be doubted. In the early stages the sores would improve in the majority of cases if any sort of treatment was adopted, but if nothing was done, they became indolent. A fortnightly change of treatment appears desirable because after two weeks the sore becomes resistant to any form of treatment. For large ulcers skin grafting is necessary.

JOHN L. LINDQUIST, M.D.

Gallagher, J. L.: Definitive Treatment of Severe Wounds. *J. Am. M. Ass.*, 1943, 123: 675.

The advantages of compression dressings are emphasized and are as follows:

1. They control hemorrhage from the wound and thus the use of the tourniquet with its hazards, tedious timing, and releasing is avoided, and, more important, they control hemorrhage from wounds in which the tourniquet is not applicable.
2. They insure ease and rapidity of aseptic application of a primary, adequate dressing by the nonprofessional attendant.
3. They facilitate the application of dressings to dependent parts, as the under surface of the arm, the groin, or the under surface of the chin.
4. They bring a splinting effect to the wound and its immediate area.
5. By pressure, they prolong viability of the tissue through aiding the return circulation from the wound.
6. They obliterate spaces and crevices in wounds by the compression.
7. By their sterile bulk they form a barrier against added contamination.
8. They create a safety factor in that they may remain as originally applied without additional adjustments or changes for a number of days when necessary, as under battle conditions.
9. They permit easy, as well as efficient, application to any wound with or without spurting vessels under such unfavorable conditions as high wind, semidarkness, and cramped close spaces, as in multiple passenger combat planes.
10. They make a superior type of first-aid treatment available at or near the scene of injury for extensive surface injuries, such as burns, frozen members (frost bite), severe abrasions or crushing injuries.
11. They afford a dressing, the bulky resilience of which will give maximum comfort and permit firm, safe bandaging, adequate to hold it in place indefinitely.

The author's pack for compression treatment of all extensive wounds and for the Koch treatment of burns consists of 16 sterile pads 9 in. square, each pad containing 8 oz. (225 gm.) of grade 1 mechanic's waste, covered by one thickness of 44–40 mesh gauze overlying two layers of coarse gauze. Four of the dressing pads have a 5 in. by 5 yd. roller bandage of bias-cut stockinet anchored to them. The pack also contains 2 operating caps and 3 face masks (the extra mask for the face of the patient). The entire package is put up in maximum compression in a final container of tin (8 by 8 in.). Thus in this small cube there will be adequate smooth, soft, compressible, sterile surgical pads and elastic bandages to cover 1,296 sq. in. of body surface (both upper extremities, shoulder girdles, and axillas) and further individualizer strips, caps, and masks. The use of this material is described in detail. It is also well to note that this material is economical, inexpensive, and easily obtained.

The use of compression dressings is based on principles that are well established. The compression aids return circulation from the wound and in so doing tends to prevent edema. In an extensive surface wound, plasma is lost from the blood stream by escape into the tissues, the principal loss being into the tissues and not, as formerly thought, entirely out of the body. It is therefore most important that the compression treatment be instituted at the earliest possible moment to prevent shock from hemoconcentration. Since fluid escaping into the tissues and remaining there as edema will result in the tissue cells' being placed in a nonconductive medium, which also seriously compresses them and isolates them from the principal functions of the blood, the prevention of this series of events is to be desired. With this method there is no destruction of the remaining epithelium and infection is prevented.

Photographs of a severely burned patient illustrate the method of treatment and the results obtained.

LEROY J. KLEINSASSER, M.D.

Ord, A. G., Shackman, R., and Roualle, H. L. M.: Traumatic Surgery. *Surgery*, 1943, 14: 651.

This article deals with the anatomic distribution and the treatment of fractures and joint injuries encountered on the British home front during a two-year period. The infrequency of fractures of the head and trunk in contrast to fractures of the extremities is noteworthy. Emphasis is placed upon injuries commonly causing protracted disability, such as fracture of the head of the radius, fracture of the carpal scaphoid, and acromioclavicular dislocation. The indication for operation in fracture of the head of the radius is any degree of displacement likely to cause irregularity of the articular surface, which would lead to a progressive osteoarthritis. At operation it has been found, as a rule, that the injury is more extensive than the x-rays have suggested. The relative number of cases of fracture of the carpal scaphoid has been remarkable. Immediate plaster immobilization for a period of six weeks has sufficed to ensure demonstrable union both clinically and radiologically in 4 cases. Older fractures have required immobilization for fifteen or more weeks. The

majority of long-untreated fractures are operated upon immediately. Operation to stabilize the acromioclavicular joint is directed to reinforce the coracoclavicular ligaments rather than the acromioclavicular ligaments.

In fractures of the lower limb emphasis is placed upon the importance of ambulatory treatment. Details are given of a method of reducing fractures of the femoral shaft prior to the application of a plaster spica. Compound fractures are classed as to the cause of the soft-tissue wound. When the wound results from protruding bone primary suture is used, but when it results from the external violence the wound is left open following operation and the limb is encased in closed plaster. A comparatively large number of knee-joint injuries were encountered but only a small proportion of these were true cartilage lesions. The majority of patients who were sent in with suspected cartilage lesions were found to have traumatic arthritis following a wrench of the joint.

JOHN L. LINDQUIST, M.D.

Large, Col. D. T. M.: Experiences of an Administrative Medical Officer in Greece, 1941. An Address. *J. R. Army M. Corps*, 1943, 81: 205.

This is the record of a superb effort to surmount the difficulties of preparations which were too little and too late. The British had only from the latter part of February until April 6, 1941 to prepare for a campaign which they planned to prolong, but which the Germans finished in three weeks. On their arrival in February there was only one hospital available to them, a 600-bed general hospital in three luxury hotels of a suburb of Athens. This was expanded as rapidly as possible to accommodate 1,200 patients. A field ambulance company became available in March, and was set up in Larissa to accommodate 200 patients in tents. The tents were dispersed to minimize the dangers of aerial bombardment, and the fact that they were 30 yards apart added to the difficulties of nursing and feeding patients. A 600-bed New Zealand general hospital, arrived early in March and was in operation at Demerle three weeks after its arrival. Other medical units now arrived from Egypt: 2 Australian general hospitals were set up, one of 600 beds at Volos, and another of 1,200 beds at Kyphissia. An advanced depot of medical stores was opened in Athens. At the time the campaign opened, although all units were functioning, only the New Zealand and the original British units were completely ready and had a full complement of beds. Hospital trains were improvised from existing equipment as well as some received from Egypt; the Greeks co-operated in every way possible.

On April 14, 1941, only eight days after the campaign began, it became necessary to evacuate the advanced base area. Patients and personnel were removed, as well as whatever valuable equipment could be carried by hand. Ordinary trains, hospital trains, and ships were used. The hospitals in Athens soon became crowded beyond the limits of expansion: milder cases were therefore sent to a tent camp on the beach, which had nearly 1,000 in it and could have been expanded to another thousand, if necessary. Toward the end of the month it became necessary to evacuate all units from Greece, and this was accomplished with relatively few casualties despite the sinking of several ships and constant aerial bombardment of the harbor area at Athens.

HAROLD C. OCHSNER, M.D.

Tinsman, C. A., and Barrow, D. W.: Rupture of the Jejunum: A Parachute Injury. *War Med., Chic.*, 1943, 4: 415.

A flyer was forced to abandon his airplane at an elevation of 13,000 feet and pulled the rip cord on his parachute immediately on leaving the plane. He felt a terrific jerk and was then unconscious for a few moments. His shoes were pulled off, and one panel of the parachute was torn away by the rapid deceleration.

The patient promptly noticed excruciating pain in the epigastrium, which soon became generalized. He also complained of pain and tenderness in the region of the left biceps and the symphysis pubis, presumably due to injury from his parachute straps. Three hours later he was given an injection of ½ gr. (0.03 gm.) of morphine sulfate, which relieved the pain. Six hours after the injury he was driven in an ambulance to the hospital over 90 miles (145 km.) of rough roads. The trip aggravated his abdominal pain and increased his nausea and vomiting. On arrival at the hospital he was in shock, exhibiting a rapid, feeble pulse, and cold, perspiring extremities. His blood pressure was 80 systolic and 40 diastolic. He had but little discomfort except on motion of the left arm. There was slight generalized abdominal tenderness but no spasm of the abdominal musculature and no dullness in the flanks or loss of hepatic dullness. Peristalsis was not audible on auscultation of the abdomen. Ecchymosis was present over the left biceps, the right thigh, and the shaft of the penis. The testicles were not injured. Pressure over the symphysis pubis was painful; movement of the legs was not. The temperature was 97.8°F., and the urine was grossly bloody. Free air beneath the diaphragm was not demonstrable by roentgen examination. Fluid introduced into the bladder by catheter was recovered readily.

Four hours after admission to the hospital, the patient again began to complain of abdominal pain. There was some increase in rigidity of the abdominal wall, and peristaltic sounds were still absent. The temperature remained normal; the pulse rate continued to be rapid. An exploratory laparotomy was undertaken after a second transfusion.

With the patient under ether anesthesia a right rectus incision revealed 500 cc. of serosanguineous material, and an opening, 3 cm. in its greatest diameter, in the antimesenteric border of the jejunum. The mucosa was everted. Transverse closure of this defect was accomplished by two layers of continuous sutures. No further exploration was carried out, and

the abdomen was closed without drainage. Six grams of sulfanilamide crystals were left within the abdominal cavity after suction evacuation of the fluid easily accessible. The patient's condition immediately after operation was critical. He left the hospital on the thirty-sixth day and returned to a duty status on the fifty-sixth postoperative day.

Such a history is rather characteristic of patients with an intraperitoneal rupture of the intestine by nonpenetrating trauma to the abdomen. In the authors' experience and as reported by others, the immediate pain is not infrequently followed by temporary partial or complete relief of symptoms, and during this "lucid interval" there may be little except absence of peristaltic sounds or the presence of tachycardia to indicate the severity of the injury; yet it is during this period that surgical intervention must be undertaken if satisfactory results are to be anticipated. After the "lucid interval" symptoms become progressively more acute and are those associated with peritonitis from any cause.

Rupture of the intestine from any cause is rare, and, as far as can be determined, this was the first such rupture apparently due to a parachute buckle. In this instance it is believed that the incorrect use of the parachute was a contributing factor. The first error was in opening the parachute immediately on leaving a plane which was traveling at a rate in excess of 200 miles (320 km.) an hour and when the patient's momentum was considerably in excess of what it would have been at terminal velocity in a free fall, which, owing to air resistance, is approximately 135 miles (217 km.) an hour. Furthermore, the parachute harness was too large and had not been adjusted properly. The excessive deceleration, due to too rapid opening of the parachute, and the slack in the harness straps probably allowed the middle harness buckle to produce a much more severe blow on the abdomen than would have otherwise been the case. JOHN E. KIRKPATRICK, M.D.

Barry, H. C.: Treatment of War Injuries of the Large Intestine. *Med. J. Australia*, 1943, 2: 262.

The author presents his views on the essential factors in the treatment of recent wounds of the large bowel. The forward mobile surgical unit has largely met the problem of urgency of treatment. Diagnosis is often difficult since in many patients there is nothing to be seen except a possible wound of entrance. The site of entry is often in the back, loin, or buttock. If doubt exists after the entrance wound has been explored, the abdomen must be opened and inspected. This can be done quickly through a small suprapubic incision by passing a clean, dry swab into the rectovesical pouch. If examination of the swab reveals any blood or serous effusion, the whole abdomen must be explored. When the ventral aspect of the abdominal wall has been peppered by small fragments the best way to exclude a perforation is to open the abdomen and examine the underlying parietal peritoneum. This is quicker and safer than to explore each little tract. When the large intestine has been perforated, a characteristic fecal odor will almost invariably be noticed. When the site of injury is unknown the standard midline incision should be used.

In the technical management of an injury to the colon, one must consider first the blood supply and second the actual laceration of the bowel. Exteriorization of the injured bowel is the procedure of choice. If extensive damage has occurred and retroperitoneal hemorrhage is present, the colon must be widely mobilized and exteriorized. This procedure may be advisable even in the absence of perforation of the bowel. The need for the routine use of drainage, preferably through the flank for all colon injuries sutured in situ has been confirmed by an examination of patients followed to the base hospital. Treatment of postoperative ileus, transfusions, the intravenous administration of saline and glucose solutions, and the administration of sulfonamides contribute to the attainment of good results.

JOHN L. LINDQUIST, M.D.

Buxton, J. D.: Gunshot Wounds of the Elbow Joint. *Lancet*, Lond., 1943, 245: 663.

After the third Libyan battle fought in the summer of 1942, records were collected of 51 wounds involving the elbow joint. As reports were received from all hospitals the number is likely to be nearly correct; the number of wounds of the knee joint during the same period was 165.

Suppurative arthritis developed in 31 cases. The other 20 were reported as presenting nonsuppurative arthritis. Amputation was performed in 2 cases. Death occurred in 1 Indian on the ninth day.

All except 1 patient had an "operation" in a forward area. The usual sequence of events was the application of a first field dressing or "shell" dressing, and a sling; in some cases splinting was superimposed. Antitetanic serum was given at a field ambulance dressing station. The wounded man was transferred to a forward operating center as early as circumstances allowed. If he passed through "staging units," the dressing was not changed unless it was saturated with blood. The forward operating centers were at field ambulances, when the theater was usually a tent or tarpaulin on the side of a large truck; at a casualty-clearing station, usually with a tented theater; or at a well-housed hospital in Tobruk.

A number of elbows were roentgenographed before operation, but the basic principle of the forward operation was to "treat the wound" rather than spend time on dealing with the fractures or joint injury. Hence the operation carried out was excision of the skin edges of jagged and necrotic tissue, followed by removal of loose pieces of bone. Hemostasis was obtained, the wound was dusted with sulfanilamide, a soft paraffin gauze pack was inserted, and the limb was placed in plaster-of-Paris from the axilla to the metacarpal necks. The plaster-of-Paris appears to have been used for every case. A sling was applied and the patient transported to the base,

having been started on a course of oral sulfanilamide, which was continued until from 20 to 25 gm. had been given in five days. The shortest period between the patient's being wounded and his reaching a base hospital was within forty-eight hours and the longest, eleven days.

There was severe bone damage in at least 4 of every 5 joints injured. It should be noted that the olecranon was fractured in nearly half of the cases, for when the upper end of the radius and ulna were mentioned, the olecranon was almost certainly involved.

There was evidence of injury to the nerves in 16 patients. Of these, 9 had recovered in four months or less, 5 had recovered in under seven months, and the fate of 2 is not known. It is remarkable and satisfactory that the nerve damage was largely confined to intraneural or perineural hemorrhage and edema and that complete interruption of the nerve fibers was relatively uncommon. The high recovery rate of the ulnar nerve complicating this lesion was possible because of skillful primary surgery and placement of the elbow, during the period of acute inflammation, in such a position (at a right angle) that there was no tension on the nerve, as would have been inevitable had the arms been slung in a collar and cuff. The use of this appliance is undesirable, whatever the bone injury, while there is hemorrhage or edema around the ulnar nerve.

It has been mentioned that suppurative arthritis developed in 31 elbow joints. Records show that operation was performed on no patient within eleven hours after wounding. The majority of patients who afterward had either nonsuppurative or suppurative arthritis had the primary operation twenty-four hours after the wound was inflicted.

Experience shows that suppuration with osteomyelitis of the bones of the elbow tends to subside quickly, as adequate drainage can be easily provided and sequestra separate quickly and are readily discharged, because the bones are near the surface. If the elbow is placed at a right angle in full supination, and fixed in plaster-of-Paris, suppuration does not tend to spread along fascial or intermuscular planes.

The general principles in primary operation are:

1. Operative procedures should be on the posterior or lateral side of the joint in preference to the anterior or medial side, whenever possible.

2. In a grossly mutilated joint, as many loose pieces of bone as possible should be removed, and no spikes of bone should be left to protrude into the joint cavity. Should the lower end of the humerus be fragmented (with radius and ulna more or less intact) the fragments should be removed and the lower end of the fractured humeral shaft cut square. If the upper ends of the forearm bones are in pieces, the proximal ends should be trimmed to be level after removal of the fragments, if the humerus is more or less intact.

3. When the olecranon is destroyed, all the pieces should be removed.

4. Large fragments of bone should not be removed when partly attached.

5. When a primary excision of the joint is carried out, loose fragments of bone must not be left partly attached to one of the bones, nor in the joint cavity.

The author has been impressed by the results of excision of the mutilated olecranon process. Drainage of the joint is free, a second operation is seldom necessary, the wound granulates quickly, and the end-results are better than in cases treated by other methods. Rubber drainage tubes should not be inserted, but the wound should be packed with soft paraffin gauze. When posterior drainage is required but cannot be made through the wounds existing, an incision is made on each side of the olecranon.

The routine after the primary operation is splinting with plaster-of-Paris. Felt padding is required over the epicondyles and olecranon. The elbow is placed at a right angle, the forearm supinated and the wrist dorsiflexed 30 degrees. The plaster extends from the axilla to the necks of the metacarpal bones. Indication has already been given that some elbows are treated in closed plaster until freed of splinting. Alteration of this routine may be required if dressings through "windows" in the plaster are indicated. Pain or a continued rise of temperature necessitates removal of the plaster and perhaps aspiration or incision.

When symptoms and signs suggest that all inflammation in the joint has ceased and the wound is healed or nearly so, skin-grafting may be required to cover an area over the posterior surface of the joint.

When ankylosis is the ultimate aim, the limb is placed in what is considered the ideal position if this has not already been done. If, however, movement is expected, the joint is rested for another fortnight by the use of a collar and cuff or posterior plaster slab. Active movement is then commenced. At first an effort is made to get flexion above the right angle, and later exercises are given to regain extension. The limb is rested by a collar and cuff and in due course suitable rehabilitation is instituted. Should there be any reaction, the joint must be rested longer.

Unfortunately it was impossible to ascertain the end-result in each of the cases in this series. Hence any estimate of ultimate function is somewhat speculative. In the 50 patients who survived, the ultimate condition expected was: ankylosis, 17; flail elbow, 4; movement greater than 30 degrees, 22; movement less than 30 degrees, 5; and amputation, 2.

The two amputations were carried out because of the extent of the wounds, but none was required because of septicemia due to suppurative arthritis. Destruction of tissue alone is rarely an indication for amputation. Vascular injury and severe local suppuration in an ill patient may require amputation, but the surgeon should always bear in mind the value of a living hand. JOHN E. KIRKPATRICK, M.D.

Buxton, J. D.: Splinting of the Femur Fractured by Gunshot Wound: the Tobruk and Double-Cuff Plaster. *Lancet*, Lond., 1943, 245: 564.

The Tobruk plaster and the double-cuff plaster were devised for application after operation in for-

ward areas to immobilize the limb during a long journey. Experience showed that, provided the detail of splitting the cast was carried out, attention was seldom required during transit and there was no need to hurry with removal of the splint at the base hospital. Although the Tobruk plaster has been employed for treatment at the base, it is not suggested that it or the double-cuff plaster should replace the standard methods which are suitable in static hospitals.

These methods were developed to meet the demands of long lines of communication after it was found that the wounded men complained of much pain when merely splinted with the Thomas splint technique, and when it was found impracticable to use the hip spica because of discomfort and the development of plaster sores.

The important points in the application of the Tobruk Plaster are as follows:

1. Padding the area above each malleolus and around the tendo achillis. Elastoplast is then placed along the medial and lateral aspects of the extremity, and the loose ends are tied to a 7 lb. weight which is hung over the end of the table to provide extension.

2. The knee is suspended so that there is from 5 to 10 degrees of flexion.

3. A greased metal strip or rubber tubing is placed anteriorly over the extremity so that the plaster may be later split. The plaster is then applied in the usual manner and so as to allow the extension bands to emerge just above the malleoli.

4. The suspending band is then cut, the extremity is placed in a Thomas splint and supported by triangular bandages, the cast is split, and the loose ends of the extension bands are tied over the end of the Thomas splint. The cast is then securely tied to the splint.

The double-cuff plaster varies in that the plaster is placed around the entire extremity and the splint, the foot being left out. The foot then is kept dorsiflexed with a foot-piece.

Both of these methods have in common the principles of traction, extension, and plaster fixation. The Tobruk plaster was the method of choice in 1942, but it is understood that the double-cuff has acquired popularity in 1943. The Tobruk plaster probably provides better immobilization, but more experience and a longer time for its application are required. LEROY J. KLEINSASSER, M.D.

Kern, R. A., Norris, R. F., Montgomery, H., Wigton, R. S., Ferguson, L. K., and Brown, R. B.: The Treatment of Burns; a Discussion Based on Experience with 360 Cases Seen on Board a U. S. Hospital Ship. *U.S. Nav. M. Bull.*, 1943, 41: 1654.

The treatment of burns constitutes an important problem at all times; but in warfare, and particularly in naval warfare, burns may account for a high percentage of casualties (for example, 60 per cent at Pearl Harbor, due chiefly to flash burns from explosions of powder, bombs, torpedoes, and projectiles, especially in enclosed or partly enclosed spaces. Added hazards are conflagration of inflammable liquids, fires in ships and planes, burning oil on the sea, escaping steam and scalding water, exposed and broken electrical circuits, friction (resulting notably in burns of the hands, arms, and legs when men slide down ropes, as in abandoning ship from the flight deck of a carrier), chemicals, vesicant war gases, and overexposure to the sun (in shipwreck). Furthermore, the importance of the treatment of burns is augmented and its fulfillment complicated in naval medical experience by the large numbers of patients crowded into limited spaces, with limited help and materials, and often under the difficult conditions of battle.

Medical literature has been flooded in recent years with articles on the treatment of burns, often without sufficient justification. A large proportion of the articles are open to one or more of the following criticisms: the writer commonly extols the merits of a single method of treatment, applied to a small number of patients; many authors commit the error of drawing too generalized conclusions from limited data or from particular types of burns or treatment; some still think too much of the treatment of the local lesion and too little of the patient as a whole.

The authors have had the opportunity to see an unusual number and variety of burns on a U. S. Hospital ship. In the past twelve months some 360 patients have been under their care: some were victims of one or more of all the types of burns enumerated except those due to vesicant war gases. The burns presented every degree of extent and depth. Some were seen as early as minutes after their occurrence, others following intervals up to several weeks later. The treatment was inaugurated by the authors in some instances; in the majority of the cases, however, this was done by many other medical officers. Therefore, the authors observed the results of various methods of treatment in many examples of a wide range of burn cases, both as to cause as well as to extent and degree, and in burns at all stages of their progress.

Treatment requires observance of certain fundamental principles. Burn patients do not die of their burns; they die as a result of systemic changes which the burns induce, notably shock, toxemia, and sepsis. Therefore, the first principle is a clear concept of the pathology and altered physiology involved. The majority of burn cases, to be sure, since they are not sufficiently extensive, do not produce any considerable general derangement. However, in more severe cases the burn produces rapid and profound changes in the body as a whole that will end in early death, unless they are prevented, or recognized, measured, and treated promptly and with meticulous thoroughness. In such severe cases, too, the local treatment itself is not without danger: as, for example, liver necrosis from absorption of tannic acid, or renal damage from sulfathiazole used locally as well as internally.

Judgment in the selection of local therapeutic measures is likewise of fundamental import, not

necessarily as to life or death, but certainly as to the promptness and completeness of healing. It must take into account a number of factors: the nature of the burn, its extent and depth, the part of the body involved, the general condition of the patient, and the time that has elapsed since the burn was incurred. Of major practical importance in this regard, too, are the number of cases concerned and the circumstances under which they must be treated. If a large medical staff and unlimited materials are available, the choice of method of local treatment might be quite different from that resorted to when one man must treat many cases in an emergency. Burns are, of course, always emergency affairs. Therefore preparedness to treat all types of burn cases is essential to insure the best results.

Shock is the greatest single cause of death, accounting for from 60 to 75 per cent of all fatalities in burn cases. A clear understanding of its cause, prevention, recognition, and treatment is therefore of paramount importance.

In the mechanism of the production of shock in burn cases a number of factors are involved; some are well-established, while others are not so well understood. The nervous and psychological factor rates first consideration. Pain is the most expressive single term that is here applicable, but the concept also involves fright, apprehension, and the nervous fatigue after frantic overexertion. This factor is undoubtedly the earliest cause of shock (often called primary shock) and is in some degree undeniably present in every case. It is augmented by nearly everything that happens to the patient, including, often enough, the treatment applied. It is conditioned to some degree by the temperament of the patient. It is decidedly influenced by the site of the burns; involvement of the face, abdomen, and genitalia will lead to death with much smaller total areas affected than involvement of other parts of the body.

Loss of fluid from the circulating blood, resulting in hemoconcentration, is the most important cause next to operation in producing shock during all of the first twenty-four hours, and commonly for forty-eight hours, after the burn (secondary shock). The recognition of this factor by Underhill and his associates in 1923 is perhaps the outstanding single advance in our knowledge of the mechanism of shock in burn cases, for it has led to the intravenous use of plasma to counteract the hemoconcentration. Fluid loss begins almost immediately and continues, according to the area and depth involved, for from one to several days. Allen and Koch have applied the apt term, "white hemorrhage" to the process. The burned area contains much, probably most, of the lost fluid. Two-fifths of the skin contains as much water as does the whole quantity of the circulating blood. Clinicians have been inclined to think chiefly in terms of total fluid lost as shown by hemoconcentration, with a view to treatment by fluid replacement. The authors believe that certain measures, notably pressure bandages over burned areas, applied early, will prevent some of the fluid loss and so will to some degree prevent the development of shock. The absorption of toxic products is probably also at times a factor in the production of shock, although its relative importance is still debatable.

Probably the chief factors in the causation of toxemia are absorption of toxic matter from the burned area and the changes in the composition of the blood following the loss of plasma. Toxic absorption may also involve materials used in local treatment, such as tannic acid and sulfonamides. The term "toxemia" is vague, and the picture to which it is applied may embrace several components. A shift of electrolytes is commonest. As Tenery and Lam have shown, this is usually characterized by a fall in plasma sodium and chloride and a rise in plasma potassium. A fall in serum protein can further complicate the picture. These changes are initiated by the plasma loss and increased by the subsequent hemodilution that results when, after the first day or two, the patient drinks huge amounts of liquids.

Sepsis, after shock, is the most important cause of death, and the local infection to which it is due is also a cause of additional destruction of living epidermis and of delayed healing. Sepsis is due to infection arising secondarily in the burned area. It may appear as early as the fourth or fifth day, and it may be a threat far into convalescence, so long as an infected burn lesion remains. The infection is chiefly due to contamination through attendant personnel (droplet infection from nose and throat, poor masking, unsterile hands, dressings, and instruments), to a lesser degree to attendant circumstances (trauma: gross contamination with clothing or fuel oil). Burned areas are rendered sterile by the heat which produces them, and they tend to remain so during the first twelve hours. Therefore the early recognition and treatment of infection under a therapeutic eschar are matters of serious importance.

In the prevention and treatment of shock the relief of pain with ½ gr. of morphine is initially indicated in severe burns. The prevention of fluid loss may be partly achieved by effective pressure bandages. The replacement of lost fluid is best accomplished with plasma in calculated doses by hematocrit or hemoconcentration determinations. The conservation of body heat should aim to preserve an optimum body temperature between the extremes of sweating and shivering.

In the prevention of sepsis an aseptic technique must be maintained during the primary dressing and all subsequent dressings. Although a burn is primarily sterile, a barrier to infection consisting of water-soluble ointment prepared with 3 per cent of the microcrystalline form of sulfathiazole spread on sterile fine meshed gauze has given the best general results, when used in conjunction with elastic pressure bandages.

Débridement must be modified to prevent an increase in shock. The simplest and gentlest cleansing of the burn area with plain white soap and water,

cutting away with scissors the larger blisters and detached epidermis—the part which does not hurt is safe—is the procedure of choice. When a burned patient is covered with fuel oil, it has been found that mineral oil applied with cotton waste followed by soap and water is the best and least traumatizing method of preparing the burned surface for the application of the definitive dressing.

The authors emphasize four "musts" for the primary local treatment of burns:

1. It must exclude air. This has primarily the object of relieving pain.
2. It must exclude bacteria. This means that the dressing must remain intact in spite of movement and manipulation.
3. It must in itself possess a bacteriostatic or antiseptic action.
4. It should exert local pressure to lessen fluid loss (edema, oozing).

In addition there are four desirable attributes of any method of local treatment to be used on board ship and under battle conditions:

1. It should be easy to apply.
2. It should be available for mass treatment of many cases by a limited personnel.
3. It should be economical, and sparing of supplies and materials.
4. It should be usable in the secondary local treatment of burns when these have become infected. This last is to conserve space on board ship.

In the authors' experience the continuous saline bath does not prevent loss of fluid nor infection. Although sterile wet dressings with saline solution have advantages, they have numerous drawbacks such as daily exposure of the burn to infection and the waste of supplies and of nursing time. The triple dye treatment has been disappointing in most respects. The paraffin wax spray has been uniformly unfavorable since infection spreads beneath the wax crust rapidly and it cracks badly. Its chief value is limited to first-degree burns. Tannic acid has a number of advantages but these are outweighed by the disadvantages of destroying surviving islands of epithelium, of masking infection beneath the tough eschar, and of producing liver damage. Tannic acid must never be used on burns of the face, ears, hands, and genitalia. Burns of the face, ears, and genitalia can be satisfactorily treated with the sulfathiazole ointment, a simple gauze mask and gauze fluff being applied without bandages. In deeper burns of these areas microcrystalline sulfathiazole powder is blown on the burns with an atomizer and covered with wet saline dressings; a repetition of this procedure is carried out as indicated until healing occurs or until the burn is ready for skin grafting.

The sulfathiazole water-soluble ointment dressing has at least three outstanding advantages: it can be applied to any part of the body; it can be applied to any type of burn; and it can be applied where wounds are present in burned areas.

The sulfathiazole powder with wet saline dressings is applicable to all stages of the secondary treatment of deep burns that are infected and to those that require skin grafting.

The same safeguards concerning the use of sulfonamides are required, viz., daily urinalysis, and leucocyte, hemoglobin, and blood sulfonamide estimations at appropriate intervals.

JOHN E. KIRKPATRICK, M.D.

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Dodd, H.: Blood-Pressure Readings in Surgical Work. *Brit. M. J.*, 1943, 2: 811.

The Moot-McKesson cardiac index can be applied to surgical patients with the view of detecting a poor operative risk. The cardiac index is that fraction or percentage value resulting from the division of the pulse pressure by the diastolic pressure. The pulse pressure is the systolic pressure minus the diastolic pressure. A patient with a blood pressure of 120/80 mm. has a cardiac index of 40/80, or 50 per cent. When the cardiac index ranged between 33 and 80 per cent, the patient proved to be a good surgical risk. Values above 100 per cent or below 25 per cent prohibited surgical operation until the index value came into normal range.

The cardiac index was of practical value during the course of the operation and during the postoperative period, in that it served to indicate the development of some complication. An abnormal cardiac index indicated the need of active medical treatment. The conventional cardiac tonic is effective only for cardiac weakness and cannot be used as an emergency pressor agent. The combined use of coramine and pholedrine were of great value in cases in which cardiac and blood-pressure failures were coexistent. The loss of body fluids as from trauma or an operative procedure adversely affected the cardiac index, which could be restored to normal by the infusion of blood or plasma.

Illustrative cases were cited in which the cardiac index prevented possible surgical calamities.

BENJAMIN G. P. SHAFIROFF, M.D.

Zintel, H. A., Rhoads, J. E., and Ravdin, I. S.: The Use of Intravenous Ammonium Chloride in the Treatment of Alkalosis. *Surgery*, 1943, 14: 728.

The need for a more effective parenteral method of correcting alkalosis has arisen with increasing frequency during recent years. Hartman and Senn pointed out the usefulness of intravenous administration of a solution of sodium lactate for overcoming acidosis, but no preparation for parenteral administration has been generally available for the correction of alkalosis. In a limited number of cases, ammonium chloride given intravenously has proved to be highly effective in combating alkalosis.

Undoubtedly, the use of continuous suction drainage of the stomach, especially in the preoperative preparation of patients with pyloric obstruction, has been responsible for most of the cases of severe alkalosis. When patients with pyloric obstruction are

first hospitalized they usually have a considerable degree of alkalosis from vomiting alone, since the vomitus contains more anions (especially chloride) than it does cations other than hydrogen. Suction drainage further accentuates the alkalosis.

In the patient with excessive gastric drainage, replacement of the drainage fluid by sodium-chloride solutions in quantities calculated to keep the patient in positive water and electrolyte balance does not always effectively combat alkalosis. Alkalosis not only may produce tetany and convulsions but it may produce serious renal damage, the alkalosis nephrosis described by Nicol and others. Therefore, it seems wise to overcome the alkalosis and to restore the electrolyte balance of the blood as promptly as possible. The intravenous administration of ammonium chloride is not only effective but also prompt in its action.

Two per cent solutions of ammonium chloride were prepared by dissolving 20 gm. of ammonium chloride in a liter of water, 0.9 per cent sodium chloride solution, or 5 per cent dextrose solution. In most instances the solution was brought to boiling just before the ammonium chloride was added and then allowed to cool slowly. It was then used as soon as it had cooled sufficiently.

No serious reactions have been encountered, but three transient reactions have occurred. Two of the patients complained of a sensation of lights flashing before their eyes and the third patient had a chill lasting three minutes, with a rise of temperature to 102° F. It may be of interest that the 2 patients who experienced the scintillating scotoma received a solution of ammonium chloride in distilled water with no other solute, whereas the patients who had no reactions received ammonium chloride in solutions of either sodium chloride or glucose.

Severe alkalosis may result from continuous gastric suction, especially in patients with pyloric obstruction. Ammonium-chloride solution was administered intravenously to 7 patients with alkalosis without evident harm. It was effective in rapidly lowering the serum carbon dioxide at the rate of approximately one volume per cent for each gram administered to adults of medium size and weight. Sufficient evidence has not accumulated to permit determination of the safety of this method of administration, but the method appears sufficiently safe to warrant its use in severe alkalosis that cannot be corrected by the administration of salt and fluids promptly enough to avert the danger of renal changes.

JOHN E. KIRKPATRICK, M.D.

Meyer, E., and Vicher, E. E.: Germicidal Activity of Alcohol, Hydrochloric Acid, and Aluminum Potassium Sulfate: Their Effect on Cutaneous Flora. *Arch. Surg.*, 1943, 47: 468.

In this study of the germicidal activity of various chemicals, a routine of scrubbing the hands in successive basins was employed.

The hands were scrubbed for one minute in each of 14 bowls. One cubic centimeter of the liquid from each bowl was then placed in a Petri dish and agar was mixed with this sample. This mixture was cultured, and at the end of forty-eight hours the number of colonies was counted. Graphs were then prepared, the basin number being used as an ordinate and the number of colonies as the abscissa. The number of colonies grown was always highest in the first basins, and then a decline in number was noted. It was found that soap and water and distilled water were about equally effective, but that 70 per cent alcohol, 0.5 per cent hydrochloric acid, and 10 per cent aluminum and potassium sulfate were considerably more effective.

In a slightly different series of experiments, the hands were scrubbed as before through seven basins of soap and water, then soaked for two minutes in the chemicals. Rubber gloves were then applied, worn for one hour, and then removed, and the hands were washed through the remaining 7 basins. In this series a considerable number of colonies were observed when soap and water only were used. In the 70 per cent alcohol and the 0.5 per cent hydrochloric acid, very few colonies were observed, but a fair number were present in the 10 per cent aluminum and potassium sulfate.

The authors conclude that 70 per cent alcohol and 0.5 per cent hydrochloric acid are efficient for presurgical preparation of the surgeon's hands.

JOHN W. EPTON, M.D.

Barsky, A. J.: Use of One Flap to Restore Extensive Losses of the Middle Third of the Face. *Ann. Surg.*, 1943, 118: 988.

A simplified method of restoration of extensive losses of the middle third of the face is presented. The patient, age forty-three, had sustained a gunshot wound resulting in extensive loss of the middle third of the face (Figs. 1a, b, and c). The entire nasal appendage had been destroyed, the upper lip was gone, and the cheeks were obliterated from the level of the occlusal plane of the teeth upward to the malar bone. The entire maxilla was absent except for its most posterior portion, together with a small remnant of the hard palate containing only the second and the third molar teeth on the left side.

A plaster cast of the face was made and the proposed restoration was built up in modeling clay. An impression was then taken to provide a negative. A latex rubber pattern, which could be flattened out, was made, and a duplicate in tinfoil was used to obtain the flap from the forehead. A double pedicled flap from the forehead with a pedicle on either side in the region of the temple was formed and lined, and the donor area was skin-grafted. A simple prosthesis was constructed from acrylic resin. At the second operation the buccal inlay was placed and the denture inserted. The third operation consisted of placing the flap in its new position, and the fourth and fifth operations, of severing the pedicles one at a time and suturing the flap on either side to the cheek. The remnant of pedicle, which had been tubed, was opened up and returned to the forehead.

a b c d

Fig. 1. a, Preoperative photograph, right profile; b, left profile; c, front view; d, the completed restoration; view of right profile. (Courtesy of J. B. Lippincott Co.)

At the sixth operation the flap was trimmed to form the nose, the flattened pattern being used to fashion the nasal alar rim and philtrum. The final operation consisted of restoring the vermilion border to the reconstructed lip. This border was taken, in the form of hinge flaps, from the mucous membrane along the edges of the defect. The final result is illustrated in Figure 1d.

A method of reversing the flap is described for male subjects so that, if unavoidable, the hairy portion of the forehead may be utilized to form a mustache. JOHN L. LINDQUIST, M.D.

Swenson, S. A., Jr., and Harkins, H. N.: Cutis Grafts; Application of the Dermatome-Flap Method: Its Use in a Case of Recurrent Incisional Hernia. *Arch. Surg.*, 1943, 47: 564.

Hitherto, the use of cutis grafts has been almost entirely limited to the field of plastic surgery. Cutis material, however, is easily obtainable, and is universally applicable in the repair of hernial defects.

The entire operative procedure is carefully detailed, and the dermatome-flap method of closure of the cutis donor area is presented, since previous reports have omitted description of any satisfactory method of closure. SAMUEL KAHN, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Gurd, F. B., Ackman, D., and Smith, F.: Planned Timing in the Treatment of Wounds and Infections by Means of Infrequent Occlusive Dressings. *Ann. Surg.*, 1943, 118: 921.

The authors demonstrate how well known surgical principles can be co-ordinated and most successfully applied by organized, timed technique. These principles include:

1. Efficient first aid by adequate occlusive dressing, relief of pain, hemostasis, and temporary splinting.
2. Excision or débridement of fresh wounds.
3. Surgical asepsis and antisepsis.
4. Wound (curtain) drainage by the employment of packing gauze impregnated with liquid paraffin.
5. Closed or occlusive dressings.
6. Rest of the part.
7. Infrequent change of dressings with proper drainage.

The authors also discuss the bacteriology of wounds, wound suturing, and chemotherapy.

J. M. MORA, M.D.

Strakosch, E. A., and Clark, W. G.: Studies on the Penetration of Sulfonamides into the Skin. Sulfathiazole, Sulfadiazine, and Sodium Sulfacetamide. *Am. J. M. Sc.*, 1943, 206: 610.

In a previous study, the authors found no correlation between the degree of penetration of sulfanilamide and the type of ointment base, at least when the base was of the water-in-oil or the oil-in-water type. The concentration of sulfanilamide had little effect on the tissue levels reached, but time of application had some effect.

In the present report, similar studies were carried out with sulfathiazole, sulfadiazine, and sodium sulfacetamide. In addition, a few studies are included in which, instead of intact skin, absorption by injured skin is described. Moreover, studies were made on absorption from wet packs of sulfonamide solutions, the effects of detergents and solubilizers, and, finally, the relative retention of sulfonamides by the skin after topical application.

Seven different ointment bases were used, 2 oil-in-water emulsion types of bases (O/W), and 5 water-in-oil (W/O). The sulfonamides were incorporated in these bases at concentrations of 1, 5, 10, and 20 per cent with tile and spatula.

Guinea pigs were used in most of the experiments, but a few human cases are included. Skin biopsies were analyzed for total sulfonamide concentration after varying times of application.

Sulfanilamide, sulfathiazole, and sulfadiazine, in a comparable base at comparable concentrations and times of application, gave comparable tissue levels, demonstrating no difference in penetration into in-

tact skin. Sodium sulfacetamide ("albucid soluble"), on the other hand, gave greater penetration after a three-day application time than the sulfonamide bases tested.

Increasing the concentration of sulfonamides in comparable ointment bases did not increase the absorption by the intact skin, except in the case of sodium sulfacetamide which showed a slight effect of concentration.

Increasing the time of application from one to three days increased the skin absorption of sulfonamides in all cases, especially of sodium sulfacetamide.

Of 7 ointment bases examined, the type of emulsion had no effect on the absorption of sulfonamide by the skin.

An ointment containing a solubilizer (aerosol (OT-70) and a wetting agent in greater amounts than in the other bases studied, did not give better absorption of sulfathiazole than the other bases.

The skin of guinea pigs, injured with coarse sandpaper by rubbing until bleeding occurred, absorbed much greater amounts of sulfonamides from ointments than intact skin. Sodium sulfacetamide is especially penetrating into injured skin.

Injured skin absorbs sulfanilamide and sodium sulfacetamide from wet packs to a much greater extent than from ointments. The gauze packs were kept saturated with a 1 per cent aqueous solution containing 0.1 per cent aerosol, and a 10 per cent aqueous solution of sodium sulfacetamide containing 0.1 per cent aerosol. Skin biopsies were made at two and six hours.

To determine skin retention, 1 per cent sodium sulfacetamide and sulfanilamide in a water-in-oil base (hydrosorb) were applied twice daily for three days, after which time the intact skin was cleansed. Biopsies were performed after three, four, and five days from the time of the first application. Negligible levels were encountered after five days.

DWIGHT E. CLARK, M.D.

Macfarlane, M. G.: Therapeutic Value of Gas-Gangrene Antitoxin. *Brit. M. J.*, 1943, 2: 636.

In order to evaluate the antitoxin treatment in an established diagnosis of gas gangrene, a survey of 139 cases was conducted. This formed a very small proportion of the total number of wounded. The care of these wounded was under surgical specialists. Only those cases were included in which the presence of marked toxemia was noted.

The cases analyzed were graded according to the time of administration of antitoxin, as follows: (a) those in which the initial dose was given within six hours of the diagnosis; (b) those in which the initial dose was given from six to twenty-four hours after the diagnosis; (c) those in which the initial dose was given more than twenty-four hours after the diagnosis. The initial doses ranged from 4,000 units given intravenously at the time of diagnosis to 40,000 units given intramuscularly.

There were three groups of patients who did not receive the composite treatment recommended, and the mortality in these was as follows: in those who had no surgical treatment and no antitoxin, 100 per cent; in those who had antitoxin but no surgical treatment, 92.4 per cent; and in those who had surgical treatment but no antitoxin, 72.8 per cent.

The mean fatality rate of all the patients who received both antitoxin and surgical treatment was 45.5 per cent. The decrease in mortality following treatment with antitoxin is due almost entirely to the decrease in the group treated within six hours of diagnosis. The mortality percentage was 35.2. Of the patients treated in from six to twenty-four hours after diagnosis, 75 per cent lost their lives; of those treated after twenty-four hours, 50 per cent died.

From these figures it is seen that the effect of antitoxin was more pronounced in those who received the initial therapeutic dose soon after diagnosis, but this difference was probably due not only to the speed of administration but also to the fact that a greater proportion of the patients in this group received a large total dosage (50,000 units or more) of antitoxin.

Patients in whom the gas gangrene involved the thigh, buttock, or abdomen, showed a poorer response to doses of antitoxin of the type recommended than those in whom the site of the infection was more favorable to its elimination. More than 90 per cent of the patients had received sulfonamide drugs, and the numbers untreated with drugs were so small that it was not possible to find out from the records whether the combined use of surgery, sulfonamide drugs, and antitoxin was more effective than that of surgery and antitoxin.

These results emphasize that the most rational treatment of gas gangrene is the use of surgery and bacteriostatic drugs to control the infection, and the use of antitoxin to alleviate the toxemia.

STEPHEN A. ZIEMAN, M.D.

Fisher, A. M.: The Antibacterial Properties of Crude Penicillin. *Bull. Johns Hopkins Hosp.*, 1943, 73: 343.

The growth and preparation of crude penicillin is relatively simple and can be carried out in any bacteriological laboratory. The chief drawback to its use is its instability; however, it can be preserved for long periods if neutralized and kept frozen. It is also relatively stable at icebox temperature and it usually remains active for several weeks if kept in rubber-stoppered bottles. It should not be left at room temperature for more than a few hours at a time, and between treatments it is best to replace it in the icebox or to refreeze it if the intervals between use are very long. The authors have found, in using the medium prepared with brown sugar, that by freezing and thawing the penicillin, it can be recovered from the lower portion of the container in a concentration which is sometimes 10 times as great as that of the top.

The most satisfactory way in which to test the potency of the penicillin in any infection is either to isolate the organism responsible for the infection and

then determine the degree of its inhibition in liquid media by the penicillin, or to make similar tests with the whole culture just as it is received. In preliminary trials with cultures received mainly from chronic sinus infections, it seems that this method may offer an accurate guide to its usefulness in treating these infections, as the in vitro activity appears to parallel its effect in the tissues to a considerable extent.

The crude penicillin is not toxic to animals when administered in large amounts either intravenously, subcutaneously, or intracutaneously; nor are there signs of local irritation of tissues or of development of hypersensitivity in these animals. The penicillin also was found to have very little untoward effect on growing tissue cells. In patients no local discomfort was produced by its application to ulcers nor by its being sprayed in throats, but marked irritation sometimes resulted from its instillation in the nose. This was much less marked, however, if it was diluted from one to three times with normal saline solution.

The penicillin exerted its most marked antibacterial effect on streptococci (all except the alpha-streptococcus fecalis), pneumococci, anaerobic streptococci, meningococci, and staphylococci. More of the latter were studied than of any others and about 13 per cent of them were resistant to the penicillin. The reason for this resistance is not clear. It is dependent to a slight extent on the number of organisms present, for when very few are used in the test their growth can be inhibited. Other resistant organisms included the escherichia coli, proteus, and Ps. pyocyanea. E. typhosa was resistant to the regular penicillin but young cultures of two new strains of penicillium on synthetic medium were effective against this organism in low dilutions. Contamination of the media during growth, or of the active filtrate by any of these organisms or by bacillus subtilis may completely inactivate penicillin.

The crude penicillin was only moderately active against two strains of clostridium welchii, but quite active against a third one; others have found this organism quite sensitive. As mentioned previously, there have been reports of the successful use of penicillin in experimental clostridium welchii infections.

The organisms are killed in the lower dilutions of the penicillin and inhibited in higher ones. The bactericidal action does not take place very rapidly, but in the stronger dilutions it is quite apparent at the end of one hour and nearly complete in from five to ten hours. At slightly higher dilutions the first effect is one of inhibition for three or four hours and then gradual sterilization; at still higher levels all these reactions are slower and less complete, and then there is regrowth after twenty-four or forty-eight hours. The effect on the bacteria may be, in part, lytic, as definite clearing of cloudy cultures which have been sterilized by the action were found to contain only a very small amount of granular debris in their sediments. The streptococci killed in this way were still recognizable in the sediment, although they were obviously changed.

Clinical experience with the crude penicillin is still very limited, but encouraging enough to make us feel that it will find a place in the local therapy of certain infections. Its lack of general or of tissue toxicity, its activity against certain organisms not affected by the sulfonamides, and the fact that it is not inhibited by the body fluids, by pus, nor by para-aminobenzoic acid are points of definite advantage over some of the other chemotherapeutic or biotherapeutic agents. GEORGE A. COLLETT, M.D.

Hamre, D. M., Rake, G., McKee, C. M., and MacPhillamy, H. B.: The Toxicity of Penicillin as Prepared for Clinical Use. *Am. J. M. Sc.*, 1943, 206: 642.

The toxicity of penicillin given intravenously in a single injection to mice, guinea pigs, and rabbits was found to be low. About 100,000 F.U. (1 gm.) of penicillin per kgm., given intravenously, caused a severe reaction and death. When prepared for clinical use and given subcutaneously over a period of several days in dosages of from 7,000 to 12,000 F.U. per kgm. per day, it caused the death of guinea pigs but not of mice or rabbits. However, guinea pigs were not killed by a dose of approximately the same size of that used clinically (1,000 F.U. per kgm.) when it was given subcutaneously for twenty days. All of the animals that received penicillin subcutaneously showed a severe reaction at the site of injection. Of penicillin prepared by different methods in two different places, 7 samples were toxic when given to guinea pigs subcutaneously for several days. Guinea pigs were not protected by large doses of sodium ascorbate from the toxicity of repeated subcutaneous doses of penicillin.

WALTER H. NADLER, M.D.

ANESTHESIA

Hoffman, R.: Demerol, a New Departure in Analgesia: An Evaluation of Present Therapeutic Claims. *Current Res. Anesth.*, 1943, 22: 336.

Demerol was first synthesized by Schaumann and Eisleb in 1939. Its analgesic index rivals that of morphine and is much greater than that of codeine, pantopon, dilaudid, and papaverine, 12.5 mgm. of demerol approximating the analgesia of 17 mgm. of morphine. However, the author found that morphine was 20 per cent more analgesic than demerol.

Demerol is a colorless crystalline powder, neutral in reaction, freely soluble in water, and not decomposed by boiling. It is put up in 0.05 gm. tablets for oral use and in 100 mgm. ampoules for deep subcutaneous injection.

It has a threefold action: sedative, analgesic and spasmolytic.

Its sedative effect is only moderate and for this reason it can be taken by the ambulatory patient without his experiencing much sedation. It leaves no "morning hangover." The drug's low sedative ratio and high analgesic index characterizes it as the ideal analgesic for ambulatory patients.

The spasmolytic or anticolic effect is manifested by its effective relaxation of smooth muscle of the gastrointestinal tract, urinary bladder, uterus, and bronchi. The drug inhibits segmental peristalsis but activates propulsive peristalsis. It is utilized well in the treatment of colicky enteritis and in the asthmatic and pleuritic patients. It has been very effective in relieving angina pectoris and smooth muscle spasm.

The drug is administered orally or subcutaneously. An effective method for chronic sufferers who need to work is to inject 20 mgm. morning and evening, and then, if necessary, supplement these injections with 2 tablets orally at noon and midevening.

Demerol does not effect the blood pressure or alter the blood-sugar levels. It has no action on the hemoglobin, red cells, white cells, or differential count. It delays gastric emptying about 20 per cent. The author has never encountered either habituation or dependence in his cases. MARY KARP, M.D.

Gordon, R. A.: The Intravenous Administration of Novocain for Analgesia in Burns. *Canad. M. Ass. J.*, 1943, 49: 478.

Novocain was injected intravenously in 10 patients with burns of varying extent, to test its value in relieving pain associated with dressing of the wounds. In 3 cases a 0.1 per cent solution was used, 1 gm. of novocain crystals being added to 1 liter of saline solution; this was administered by an intravenous drip over a period of from one to one and one-half hours. In the 7 other cases the same amount of novocain was administered in 500 cc. saline solution containing from 5 to 10 per cent glucose to make a 0.2 per cent solution. In each case there was significant relief of pain within a few minutes of the start of the infusion with no sign of any untoward reaction in any case. Urinary function was unchanged. Pain was relieved for a period of from six to twelve hours after the infusion was discontinued and all patients were alert and co-operative during the dressing. A minimum of 150 mgm. of the drug was used before the pain of the burn was relieved. The total amount of novocain given varied from 600 to 1,000 mgm. The effectiveness of novocain in producing analgesia in recent burns was demonstrated.

MARY KARP, M.D.

Tui, C., Preiss, A., Nevin, M. I., and Barcham, I.: The Experimental Toxicity and Effectiveness of Octacaine as a Local Anesthetic Agent. *Current Res. Anesth.*, 1943, 22: 301.

Octacaine is the hydrochloride of 2-(1-methyl heptyl) 2, 2 di-methyl ethyl para amino benzoate. Water solutions are stable for long periods of time and may be subjected to sterilization with steam under 15 lb. of pressure for twenty minutes without deterioration. The drug was investigated as to its toxicity and anesthetic effectiveness. These were determined by intraperitoneal and subcutaneous injections into white mice, subcutaneous injections into guinea pigs, and intravenous injections into rabbits. The criterion of local anesthetic effectiveness was determined by topical application on the rabbit's eye and by sciatic nerve block in the guinea pig. Octacaine is found to have a relative toxicity exceeding that of cocaine, nupercaine, pontocaine, butyn, and procaine. It has a safety factor next to that of procaine. It approximates the toxicity of cocaine and is found to be 15 times more potent than cocaine in corneal and sciatic nerve-block anesthesia, and from 8 to 29 times more potent than procaine.

As a surface anesthetic agent it seems superior to any agent available. As an intratissue anesthetic and spinal anesthetic agent, cautious clinical experimentation may be attempted. MARY KARP, M.D.

Martin, S. J.: Anesthesia for Thoracic Surgery in the Army. *N. York State J. M.*, 1943, 43: 2178.

In all major thoracic injuries, such problems as tissue damage, blood loss, and possible infection, and intrinsic disturbances of the circulation and respiration are intimately involved. The last are of vital concern to the anesthetist, and a prompt and thorough appreciation of the underlying pathological physiology is imperative in providing ideal anesthetic management. Some of the factors concerned are discussed in this article, special note being taken of the differences in military anesthesia as compared with civilian anesthesia.

Such factors as the type of thoracic injury, the severity of the injury, the accompanying injuries, the condition of the patient, the time interval between injury, diagnosis and treatment, the number of thoracic cases, the weapons or factors which caused the injury, and the medical service available, influence to a great extent the type of care given the patient with thoracic trauma.

In the unit, or in divisional medical service, short procedures that may be necessary are carried out either with procaine hydrochloride regional anesthesia, or with ethyl chloride or ether for open drop inhalation anesthesia.

In the Army Medical Service, competent thoracic surgeons and anesthetists are assigned to the medical units of this echelon. For extrapleural procedures of short duration in conditions unaccompanied by shock or respiratory dysfunction, local infiltration with procaine, nitrous oxide and ethyl chloride, ether, or sodium pentothal is employed. Open drop ether has been and will be the procedure of choice in the field units. In the presence of cardiorespiratory complications in extrapleural cases, regional anesthesia, or open drop ether in incipient cases of shock, has been used with success. Spinal anesthesia should not be employed for any thoracic procedure. In cases requiring intrapleural surgery the endotracheal tube with an inflatable cuff is ideal though not imperative, and provides the maximum safety.

Medical service of the theater of operation. Thoracic surgery at these medical units is not elective but not entirely definite. The selection of agent and technique is essentially the same as that noted in the

Army medical service except for the addition of block technique for extrapleural procedures, and the more frequent use of nitrous-oxide-oxygen-ether sequence with the closed system intratracheal technique.

Medical service of the zone of interior. Medical anesthesia here is as modern and as advanced as that used in civilian hospitals, and includes such agents as cyclopropane, and the advantages of excellent preoperative preparation as well as other desirable services.

From the foregoing it is evident that the Armed Forces have provided the anesthesiologists with modern methods to aid the thoracic surgeon in the adequate treatment of the wounded for the conservation of man power. MARY KARP, M.D.

Glasser, S. T., and Mersheimer, W. L.: Refrigeration Anesthesia of the Extremities. A Statistical Study. *Am. J. Surg.*, 1943, 62: 231.

Refrigeration anesthesia was used for 18 amputations through the thigh. Diabetic gangrene and arteriosclerotic peripheral vascular disease were the reasons for the amputations. Ligation of the femoral vein, preliminary to the amputation, was considered a prophylactic measure against postoperative embolism. The procedure involved the application of a tourniquet 3 in. above the proposed site of amputation. The extremity was then enclosed in a 3 in. layer of ice nuggets, the size of walnuts, and covered by a rubber sheet and blanket. A minimum of two hours of refrigeration was considered necessary to provide anesthesia for amputation at the thigh, one and one-half hours for the leg, and one hour for the lower part of the leg, ankles, and toes. For incision and drainage the procedure was the same, but the tourniquet was not applied. Unless infection had been encountered, the use of ice bags about the stump postoperatively was eliminated.

The corrected operative mortality rate was 11.1 per cent and only 2 deaths could be attributed to operative intervention. The procedure was suggested for use in the cases of selected poor-risk patients for major amputations, and for the prevention of shock and reduction of infection in patients with traumatic injury. MARY KARP, M.D.

Gready, T. G., Jr.: Some Complications of Caudal Anesthesia and Their Management. *J. Am. M. Ass.*, 1943, 123: 671.

The author reports on 121 cases seen at the Chicago Lying-In Hospital, and gives a review of the literature. The incidence of failure of anesthesia in the author's series was 16 per cent.

One of the most serious and dangerous complications is that of injecting the solution into the subarachnoid space. This happened once in the author's series. The best means of avoiding this complication is by injectiong a test dose of 8 cc. of the anesthetic solution, and allowing a period of ten minutes to elapse for possible subarachnoid injection and paralysis to occur. It is further recommended that a test dose of from 5 to 8 cc. be repeated ten minutes prior to each subsequent injection. If massive spinal anesthesia occurs, treatment, including lumbar puncture, the withdrawal of fluid, and the administration of stimulants and of artificial respiration, should be instituted immediately.

A second complication is infection. Several cases of epidural abscesses and infection are reported. Extreme care should be taken in the sterilization of the apparatus, and in the preparation of the solution and the field. As soon as symptoms of epidural abscess are elicited, surgical drainage and accessory measures such as the use of sulfanilamide, transfusion, and the injection of specific antitoxin should be employed.

A third complication is the intravenous injection of the drug. The minimum lethal intravenous dose of procaine in animals has been found to be one-tenth the amount necessary to kill the animal by subcutaneous injection. The author had one case in which this complication occurred. The reaction lasted about two minutes and disappeared spontaneously before treatment could be instituted. Treatment for this condition involves the use of barbiturates and pentothal sodium (as before an operation) if convulsive seizures are present. Rapid absorption may be delayed by the addition of epinephrine to the solution.

Sensitivity to the anesthetic drugs may occur. Much of this may be avoided by questioning every patient regarding a history of allergy. The management involves the immediate injection of epinephrine and the control of convulsions by means of barbiturates.

Injuries to nerve roots have been reported. One case from the literature presented evidence of injury to the fourth and fifth sacral roots bilaterally, and to the first sacral and fifth lumbar roots on the right side.

Broken needles present another complication. The use of malleable-type needles and the catheter has minimized this possibility.

A fall in blood pressure occurs in a fairly large percentage of the cases. Twenty-seven cases in the author's series had a drop of more than 20 mm. of systolic pressure. These changes are undoubtedly due to splanchnic dilatation as the visceral sympathetic fibers are blocked. Control of the dosage to prevent too high a level of anesthesia should eliminate this reaction in most patients during labor. The use of ephedrine sulfate and oxygen inhalation causes an immediate response.

Antesacral injection has occurred in some cases, but the complication occurs more frequently with beginners.

The advantages and disadvantages of the two methods used to perform fractional caudal anesthesia, the malleable-needle technique and the catheter technique, are discussed. It is suggested that possibly the nerve roots may become refractory to the action of the drug after prolonged anesthesia.

MARY KARP, M.D.

Waters, R. M.: The Chemical Absorption of Carbon Dioxide from Anesthetic Atmospheres. *Anesthesiology*, 1943, 4: 596.

A review of the literature on the carbon-dioxide absorption technique and our present-day concepts of this technique are discussed in detail. The historic aspect emphasized the fact that the idea of chemical removal of carbon dioxide is far from a new one and that the completely closed respiratory system was utilized in the study of the exchange of gases as early as 1777 by the scientist, Scheele. John Snow, Schwann, Jackson, and Kuhn used this technique in one form or another in their experiments.

Extensive study of soda lime has evolved a good product. The value of an indicator which would show a color change when the chemical efficiency of soda lime was exhausted was questioned by the author. The possibility of utilizing sodium peroxide as a less bulky substance than soda lime was discussed. Practically, there are two apparatus arrangements which will permit a closed-system carbon-dioxide absorption technique: the circle filter and the to-and-fro method. The details of construction of the apparatuses and the advantages and disadvantages of each technique are compared. No apparatus of either type now in use is completely free of mechanical defects when applied to certain patients. The to-and-fro mechanism has the advantage of having the entire respiratory system, including the bag, in the field of vision of the anesthetist and in close proximity to the patient. It also facilitates the controlled manipulation of the breathing bag. More heat is accumulated by this method.

There is reason to believe that anesthesia atmospheres will cause the least amount of physiological disturbance when they are constituted in gas tensions as nearly approaching those of room atmosphere as is possible while maintaining adequate concentration of the anesthetic agent. Mixtures of explosive agents which contain high tensions of oxygen or of nitrous oxide are more readily ignited than are mixtures containing the 20 per cent oxygen which exists in room atmospheres. Therefore, this constitutes a physical reason for avoiding anesthesia atmosphere containing higher tensions of oxygen than are needed to maintain adequate oxygenation of the patient. Care should be taken to maintain contact throughout the anesthetic procedure to eliminate the opportunity for a spark. This would seem more possible in the to-and-fro method than with the circle filter.

The closed mechanism has been used in thousands of cases since 1923. The saving of material has been tremendous, as compared with the open method. However, a more perfect apparatus is needed before many of the defects of this method can be completely overcome. MARY KARP, M.D.

SURGICAL INSTRUMENTS AND APPARATUS

Burman, M., and Abrahamson, R. H.: The Use of Plastics in Reconstructive Surgery. Lucite in Arthroplasty. *Mil. Surgeon.*, 1943, 93: 405.

Lucite, an organic plastic substance, is light, hard, and strong enough to withstand body weight. It is nonirritating, electrolytically inert to tissue fluids, inexpensive, easily available, and radiolucent. The authors describe the results obtained from its use in 2 ankylosed finger joints and 1 arthroplasty of the hip. Only one previous report has dealt with such uses of the newer plastic substances in reconstructive surgery. CHESTER C. GUY, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Jenkinson, E. L., and Latteier, K. K.: Nonorganic Gastric Filling Defects Simulating Carcinoma. *Radiology*, 1943, 41: 444.

In this article the authors have reported in detail 2 cases which presented most of the diagnostic features of carcinoma of the stomach, but which failed to show operative or pathological confirmation of such a diagnosis. Both of these cases presented constant filling irregularities in the prepyloric region on repeated examinations, which persisted after antispasmodic administration. Various possibilities to account for the discrepancy are discussed.

On the bases of their experience, the authors summarize their conclusions as follows:

1. Large constant deformities of the pars pylorica may be due to spasm not associated with organic disease. Atropine and belladonna had no effect in relaxing the spasm in the cases presented.

2. The presence of a constant gastric deformity does not always mean carcinoma, nor does it preclude the possibility of spasm as the cause of the deformity.

3. Filling defects due to intraluminal tumors are not difficult to differentiate. Deformities involving only the walls of the stomach, even though present at several examinations and resistant to antispasmodics, may be due to spasm.

4. The old concept that spasm of the pyloric antrum appears smooth and narrow fluoroscopically and roentgenographically is not borne out by the facts presented in the reported cases.

5. Further investigation is necessary regarding antispasmodics. A drug which could be depended upon to relax the stomach at all times would be of immense aid in differentiating gastric lesions.

A. HARTUNG, M.D.

Kemp, F. H.: Pheniodol: A Contrast Medium for Cholecystography. *Brit. M. J.*, 1943, 2: 674.

After briefly reviewing the literature relative to cholecystography, and considering previous attempts to find substitutes for the generally used phthalein compounds, the author reports his experiences with pheniodol. This substance, which was originally developed by Dohrn and Diedrich and marketed under the name of biliselectan, was subjected to clinical trial by Kleiber who reported it as being an excellent, entirely harmless, well tolerated peroral contrast medium which gives shadows superior to those obtainable by intravenous injection of tetraiodophenolphthalein.

Experimental studies of the British-made compound and clinical trials having proved satisfactory, further tests were made with preparations supplied by different firms. Administration in the form of a fine powder suspended in water, milk, or mucilage, or in the form of sugar-coated granules was found to be satisfactory. Analyses of reactions relative to taste, nausea and vomiting, diarrhea, and pain on micturation were made and are described. Visualization findings obtained are tabulated and comments are made on the value of cholecystography in general and in connection with the cases in which the new dye was used.

In conclusion, it is stated that pheniodol is a reliable peroral cholecystographic medium. Suitable preparations in doses of from 3 to 6 gm. give a shadow of the gall bladder, similar in density and filling to the best shadow that can be obtained with 4 gm. of tetraiodophenolphthalein. Pheniodol is less objectionable to take and seldom causes vomiting. Diarrhea occurs in some cases, but not more often than it occurs when tetraiodophenolphthalein is given.

A. HARTUNG, M.D.

Barden, R. P.: The Similarity of Clinical and Roentgen Findings in Children with Ewing's Sarcoma (Endothelial Myeloma) and Sympathetic Neuroblastoma. *Am. J. Roentg.*, 1943, 50: 575.

The marked histopathological similarity of lesions of Ewing's sarcoma and sympathetic neuroblastoma noted by several observers is paralleled by the almost identical roentgen appearances in some cases of these diseases. The author has had an opportunity of studying 4 children, 2 of whom died of the former condition and 2 of the latter. He reports the cases in detail. A comparison of these case histories shows how confusing the differential diagnosis of the two conditions may be from a clinical and roentgenological standpoint. In each case, the histopathological diagnosis was confirmed by several pathologists, subject to the limitations noted in the literature.

In his discussion, the author states that it may be that these two diseases are so closely related that they should be considered one complex with varying manifestations. The more likely assumption is that both are distinct tumors composed of cells with the same biological attributes. This would account for the similarity in the elective sites of metastasis.

From a consideration of the facts brought out in these case histories it is apparent that the conception that Ewing's sarcoma and sympathetic neuroblastoma are distinct clinical, roentgenological, and pathological entities should be modified. Widening of the diagnostic concept of these diseases has important practical applications as regards the therapy of Ewing's sarcoma. One of these is that amputation for cure should not be attempted in cases diagnosed upon the best evidence as Ewing's sarcoma.

Another point in therapy is that roentgen irradiation of the retroperitoneal structures is indicated in cases diagnosed as Ewing's sarcoma of bone. The similarity of the case histories in this study emphasizes this need. It would seem wiser to treat all the patients as if the bone tumor were sec-

ondary to a hidden abdominal tumor, since it is so often impossible to determine before the post-mortem examination which of the patients actually have primary abdominal tumors.

A. HARTUNG, M.D.

Evans, T. C., and Kerr, H. D.: Modification of Radiosensitivity of the Skin. Effects of Compression and Low Temperature on Roentgen-Irradiation Reaction of the Human Skin. *Am. J. Roentg.*, 1943, 50: 629.

One of the authors has had the impression for several years that areas irradiated with the radiation cone pressed tightly against the skin produced less reaction than if the cone just made contact during the treatment. Preliminary studies produced some evidence in favor of this impression but the results were not consistent enough to justify an extensive investigation at that time. However, the striking effects of reduced circulation in experimental animals obtained in this laboratory have given enough encouragement to warrant additional study on the human skin. The details of this study form the basis of the authors' article.

It was decided to use the skin of patients being given roentgen therapy for cancer of the cervix uteri. This type of roentgen treatment permitted the study of anterior, lateral, and posterior pelvic areas of skin. The areas were treated in pairs and the right side served as a control for the left. The radiation (200 kv., Thoraeus filtration, 1.9 mm. of copper half-value layer, 50 cm. target skin distance) was given through a 10 by 15 cm. closed-tip cone. The intensity of the radiation was about 19 roentgens per minute, and 200 or 300 roentgens were given at each treatment, according to the technique used. Both areas of each pair were treated on the same day and the regions were treated in sequence so that each area was irradiated once in about five days until each one had received the desired amount of radiation treatment.

The results in 13 cases so treated are described and the summarized findings in 9 of them are charted in the original article.

In order to ascertain if the effect of compression could be enhanced by cooling the skin at the same time, 8 cases were treated in a similar manner but special provisions were made to permit regulation of the temperature of the parts adjacent to the treatment cone. The results obtained in these cases are also described and shown graphically.

The results of these studies are discussed at some length. In their summary, the authors state that some positive results were obtained but the individual variation was great and the roentgen reaction was apparently affected in several instances by changes in the environmental conditions following the irradiation. It is concluded that it is advisable to use compression when possible, but low temperature in addition (as used in this investigation) is of doubtful value in view of the effort involved.

A. HARTUNG, M.D.

Hinkel, C. L.: The Effect of Irradiation upon the Composition and Vascularity of Growing Rat Bones. *Am. J. Roentg.*, 1943, 50: 516.

Analysis of microscopic sections of irradiated metaphyses and epiphyses reveals an increase in the blue coloration of the intercartilaginous matrix and an apparent increase in mineralization of the matrix. Opinion is divided as to whether this is a true increase in osseous tissue. The author endeavors to clarify this debatable subject.

Thirty healthy, female white rats one day old were used in the investigation. In each animal, one knee was irradiated and the other was used as a control. The technical factors were: 130 kv.; 1 mm. of aluminum; 8¼ in. focal skin distance; 90 roentgens per minute; and a 2 cm. field. Each animal was given 950 roentgens in air. At intervals of one, three, seven, ten, thirty, and sixty days, the animals were killed and studied. The results of these studies showed a definite retardation in the growth of the irradiated bone; this was already apparent sixty hours after irradiation. The irradiated bone contained less dry weight, less water weight, and more fat and bone ash in the beginning, but after the tenth irradiated day it contained less; the matrix weight was also less.

Vascular studies also were carried out on a series of irradiated mice. In one set of animals black India ink with 1 per cent lactic acid was injected into the aorta and the animal was immersed for three days in formalin. The legs were disarticulated at the hips and decalcified in formic acid, and then 25-micra sections were cut. Other sections were made without decalcification. Four other animals were injected with 45 per cent lead acetate and roentgenographed.

No vascular change was noted during the first two days. In from three to ten days following irradiation, the diameter and number of the vessels were smaller than in the controls. The capillary tufts, which usually extend to the metaphyseal line, were serrated and discontinuous. Two weeks later the bone contained less pigment, and the vessels were narrower, less numerous, irregularly distributed, and ended short of the cartilaginous zone. The India ink entered the tibial metaphysis more often than it entered the femoral metaphysis.

The central portions of the metaphysis contained fewer vessels, in comparison with the rich network near the cortex. Therefore, the author believes that the vascular supply of growing cartilage originated in the periosteal vessels.

Roentgenograms of animals injected with lead acetate showed no obstruction of flow through the major vascular channels including the irradiated fields. However, a definite decrease was observed in the circulatory bed of the bone, and less lead was deposited in the irradiated bone.

Later studies, one and two months following irradiation, showed a gradual return to the normal content of ash, fat, and matrix. The vascular bed never quite returned to normal; some hypovascularity persisted during the study. MAURICE D. SACHS, M.D.

RADIUM

Jacobs, A.: Radium Treatment for Carcinoma of the Urinary Bladder. *Brit. J. Urol.*, 1943, 15: 79.

Radium treatment was carried out in 93 cases of carcinoma of the bladder selected from among 400 cases treated in a period of nine years. The sessile, broad-based, nonvillous papillary carcinoma occupying the lower zones of the bladder was the most common tumor selected for radiation. Ulcerative and nodular carcinomatous growths in these situations were the other chief varieties. Tumors in the middle and upper zones were preferably submitted to partial cystectomy whenever this was technically possible. Nonpedunculated tumors with a narrow attachment to the mucous membrane which could be elevated off the bladder wall were not generally considered to require radium. Even though the size of the growth necessitated a suprapubic approach, in preference to the urethral approach, endothermic excision alone was generally employed for this variety of tumor. It was considered useless to employ radium for the diffuse infiltrative type of growth involving half or more of the bladder walls.

After visualization of the tumor by cystoscopic examination, an excretory urogram is made. Dilatation of one or both ureters and of the renal pelves may be revealed, particularly if the tumor overlies a ureteral orifice. The cystogram will frequently give a pictorial representation of the position of the growth by revealing a filling defect.

Spinal anesthesia is routinely employed. A median suprapubic extraperitoneal exposure is made, the incision extending downward to the symphysis. A full exposure of the bladder interior is obtained with the aid of a self-retaining retractor. If the growth is a papillary one, the projecting portion down to the level of the mucosa is removed by endothermy. If the tumor can be elevated from the bladder wall, a needle electrode activated by a cutting current is passed through the mucosal attachment and the whole mass is thereby completely excised. The distribution of radium is planned to give so far as is practicable a homogeneous irradiation to the tumor base and its bed. A dose of approximately 7,000 roentgens is given in each case. The areas treated are generally circular, or nearly so, and include the whole tumor-bearing area with a margin of about 1.0 cm. of healthy tissue around it. One milligram radium element needles and a screen of 0.5 mm. of platinum are used. The radium is distributed in the form of a single layer implant. For circles not greater than 3.0 cm. in diameter, 5 per cent of the radium is placed in the center, and the remainder, in at least 6 needles, around the periphery. For larger areas, concentric circles are used with a central spot. Needles are left in place for from one hundred and twenty to two hundred hours, according to the extent of the lesion. Radon seeds were used in a limited number of cases, chiefly when radium was not accessible. When the insertion of the radium is completed, the bladder is closed, with the exception that the linen threads attached to the needles are delivered through the upper extremity of the bladder incision together with a tube of the Malecot type. Diuresis is enforced from the outset, and on and after the third postoperative day daily bladder irrigation is carried out either with 1:10,000 silver nitrate or weak potassium permanganate. The needles are usually removed between the sixth and eighth days, by pull on the threads. Drainage is usually maintained for two weeks, but may be prolonged when there is marked urinary infection. Ulcer formation at the site of the radium implantation is common, and these ulcerations are frequently complicated by the development of incrustations. This is manifested clinically by frequency and dysuria, infected urine, and sometimes hematuria. The ulceration usually heals within a year or eighteen months.

Fourteen of the 93 patients were females. Fifteen of the total were in the eighth decade, 32 in the seventh, 33 in the sixth, 10 in the fifth, and 1 in the third. Eight died as a result of operation; 26 died subsequently of the disease, and in the latter the cause of death in the large majority was an ascending renal infection and consequent terminal uremia. Eleven patients are alive with the tumor still active, and in no instance in this group did the treatment result in even a temporary complete disappearance of all signs of growth. Thirty-one patients are alive with a tumor-free bladder, and 10 others are alive and clinically well but have not submitted to recent cystoscopy.

HAROLD C. OCHSNER, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Foltz, E. E., and Ivy, A. C.: Effect of Simulated High Altitudes on Subsequent Work Output. *War Med.*, Chic., 1943, 4: 471.

The importance of the role that oxygen plays in controlling aerobic muscular work is well known. Experiments were performed to determine if the work output of trained subjects is affected for some time subsequent to the exposure to simulated high altitudes.

Four medical students were used as subjects and had been trained for varying periods of time on a bicycle ergometer. They were placed in decompression chambers and altitudes of from 2,000 to 18,000 feet were simulated.

The conclusions arrived at were as follows:

1. Exposure in a decompression chamber to a simulated altitude of 10,000 feet without oxygen for one hour has no effect on the subsequent work output of trained subjects. Exposure to 15,000 feet without oxygen for one hour failed to cause a significant effect on the subsequent work output.

2. Exposure to a simulated altitude of 18,000 feet without oxygen for one hour caused a decrease in the subsequent work output of 3 of 4 trained subjects.

3. A rest period of from twenty to thirty minutes after the subjects came out of the decompression chamber was not sufficient for 3 of 4 trained subjects to recuperate completely from exposure of one hour's duration to a simulated altitude of 18,000 feet without the administration of oxygen.

4. Exposure to a simulated altitude of 18,000 feet without oxygen for one hour produced no consistent change in the ability of 4 trained subjects to recover from the effects of working to exhaustion.

5. Exposure to a simulated altitude of 18,000 feet without oxygen for one hour produced cyanosis and many subjective complaints of the subjects, the most common of which were headache, a feeling of semisomnolence, dyspnea, nausea, visual disturbances, palpitation, and an urge to void on return to ground level.

6. If air-borne troops are incapacitated secondary to anoxia or hyperventilation at any altitude, they are likely to be less capable of violent muscular effort for as long as thirty minutes after experiencing the symptoms. LEROY J. KLEINSASSER, M.D.

Brunschwig, A., and Corbin, N.: A Clinical Study of Relative Efficiency for Nitrogen Metabolism of Casein Digest Administered Intravenously and Protein Ingested by Mouth. *Surgery*, 1943, 14: 898.

The question of the efficiency of the metabolism of nitrogen administered intravenously as a casein digest, as compared to that of nitrogen ingested as protein by mouth, was studied. A group of patients, who had undergone major intra-abdominal procedures, were placed on nitrogen-balance studies the day after their operations. The urine and feces were collected and the total nitrogen loss was compared with the nitrogen intake. During the early period, casein digest and dextrose were administered, and later, a light diet containing an equivalent amount of nitrogen was permitted.

The results of these studies are tabulated. The data indicate that the efficiency in utilization of the nitrogen administered intravenously as a casein digest in man approximates that of nitrogen taken orally as a food protein. JOHN L. LINDQUIST, M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Likely, D. S., and Swirsky, M. Y.: Staphylococcus-Aureus Septicemia Treated with Penicillin. *J. Am. M. Ass.*, 1943, 123: 956.

The authors report a case of staphylococcus-aureus septicemia in a male, age thirty-six years, who had enjoyed good health prior to the onset of the present illness. The previous history is not significant, and the only abnormal objective physical findings were numerous variable sized, nonhemorrhagic erythematous macular lesions. The patient's temperature was 102°F., the pulse rate 114, and respirations 28. Supportive measures were used during the first fourteen hospital days. Blood counts were within normal limits, as were other laboratory procedures. The initial throat culture showed proteuslike organisms; the urine culture showed mixed staphylococcus albus and streptococcus infection; and blood culture showed a delayed growth of staphylococcus aureus. Chills were complained of periodically and the patient had a subsequent septic type of temperature. He did not look particularly ill.

Similar elevations of temperature, preceded by chills and accompanied by similar skin eruptions, occurred on the fifth, ninth and eleventh hospital days, while other elevations in temperature not preceded by chills occurred on the thirteenth, fifteenth and seventeenth hospital days. Repeated white blood-cell counts ranged from 14,700 to 22,080 with 71 per cent and 81 per cent polymorphonuclears. The sedimentation rate was slightly accelerated. Blood culture on the ninth hospital day showed delayed growth of type II meningococci. Culture of urine from the right kidney revealed the staphylococcus albus.

On the seventeenth hospital day, sulfathiazole (4 gm. initially and 1.5 gm. every four hours, night and day) was started. A septic temperature continued for four days. The blood culture was positive for the staphylococcus aureus on the seventeenth

hospital day. On the twenty-fourth hospital day the patient had a chill, with an especially high fever. These findings might have been due to drug intoxication. Sulfathiazole was discontinued on the twenty-seventh hospital day and the administration of penicillin sodium was started by the intravenous route. There was a rise of temperature to 104.6° F., followed by a rapid and continuous drop to 99° F. during a period of twenty-four hours. Thereafter the temperature continued to be normal (it rose to 100° F. on only two or three occasions). The white blood-cell counts and sedimentation rates returned to normal.

Blood culture on the thirty-second hospital day, five days after the institution of penicillin, showed rare colonies of the nonhemolytic staphylococcus albus, while on the forty-fifth day the blood culture contained only some diphtheroid organisms. The patient was discharged from the hospital on the fifty-seventh day. Blood cultures made on the forty-eighth and fifty-seventh hospital days showed delayed growths of the staphylococcus albus.

Following his discharge from the hospital, the patient has remained well for three months. Blood culture on the sixteenth day after discharge showed less than one staphylococcus albus colony per 5 cc. of blood. Another blood culture, made on the thirtieth day after discharge, showed only one hemolytic staphylococcus colony on the entire plate. Repeated blood cultures since that time have been negative, and blood counts and sedimentation rates normal.

The penicillin dosage was 60,000 Oxford units of penicillin sodium for three days, 30,000 units for ten days, and 20,000 units for ten days, all in divided doses given intravenously. Twelve blood cultures were taken during the period of hospitalization, 8 of which proved positive for staphylococci; 4 revealed the staphylococcus aureus, 3 the staphylococcus albus, and 1 a type which could not be identified. The improvement in the general condition and well being of the patient within twelve hours after the institution of penicillin was dramatic, and recovery thereafter was uneventful.

RICHARD J. BENNETT, JR., M.D.

DUCTLESS GLANDS

Goldman, H. M.: Experimental Hyperthyroidism in Guinea Pigs. *Am. J. Orthodont.*, 1943, 29: 665.

An experiment was performed to discover the effect on dentition caused by the feeding of desiccated thyroid to guinea pigs. The animals were given a normal diet with green vegetables, plus thyroid. The principal changes occurred in the dentin, pulp, and bone structures. The odontoblasts became deranged with pyknotic nuclei and marked changes occurred in the dentin.

Two grades of dentin formation were observed, one type being more regularly formed than the other. The more regular dentin showed striations. The dentin tubules decreased in number and became very tortuous. In the irregular type of dentin, the odontoblasts and blood vessels became enclaved, and the structure assumed the appearance of osteodentin. This latter type was observed on the lingual side; the dentin on the labial side was more regularly formed.

The bone itself showed evidence of osteoporosis. These changes were differentiated from those found in vitamin A and C deficiencies, hyperparathyroidism and low-calcium experiments, and magnesium deficiency.

GEORGE A. COLLETT, M.D.

Goetsch, E.: A New Concept Regarding the Origin of So-Called Primary Carcinoma of the Hyperplastic Thyroid. *Ann. Surg.*, 1943, 118: 843.

The author carefully studied 9 carcinomatous lesions which occurred in the diffuse hyperplastic thyroid gland. The pathological findings revealed that in 3 instances the lesions were definitely not primary in the hyperplastic gland. They were unmistakably secondary to fetal adenomas, and presented all the histological criteria of malignancy. In several of the remaining cases the lesions, because of the embryonic character of their epithelium, were strongly suspected of having originated in adenomas. The author questions whether carcinoma is ever truly primary in the hyperplastic thyroid gland, and believes that it originates in a pre-existing minute adenoma.

The author offers the theory that the true adenoma probably has its origin in certain cells which occur in the normal and hyperplastic follicle, and which are known to have characters of fetal or embryonic cells. They are not uncommonly found singly or in pairs and are interposed between the follicular lining cells of the hyperplastic gland. They can be clearly differentiated from the remaining cells of the follicle by their differences in size and shape and in the nature of the mitochondria which their protoplasm contains. They differ in that they have a rich content of mitochondria which are rounded, short, filamentous, or granular, and resemble fetal or embryonic cells, whereas in the hyperplastic cell of exophthalmic goiter the mitochondria are long, filamentous, or spirilliform, and fewer in number. Inasmuch as the follicular "fetal" cells are similar in appearance to the cells of the fully developed fetal adenoma they may readily be the ancestral cell of this tumor. The author believes it plausible that these follicular "fetal" cells might well predispose to the development of carcinoma either primarily or through the intermediate stage of a benign adenoma.

The rare coexistence of true adenoma and the hyperplastic gland of exophthalmic goiter doubtless accounts for the extremely low incidence of carcinoma in exophthalmic goiter. In recognized clinical carcinoma involving exophthalmic goiter, it would be impossible to demonstrate the adenomatous origin of the neoplasm because the original adenoma would have been obscured by the malignant overgrowth.

The adenoma is essentially an abortive attempt to form normally differentiated tissue. In failing to accomplish this its cells tend to remain fetal in type and the adenoma continues as a precancerous lesion

and as an intermediate stage between the original fetal cells and eventual malignant degeneration. The adenoma may grow to a considerable size as a benign tumor and later become malignant or, as the author's studies show, it may be malignant from its earliest period when virtually submicroscopic in size.

The author's study illustrates the futility of supposing that a truly early diagnosis of carcinoma could be made, because there is evidence that these predisposing lesions, which are so small as to be easily over looked in routine examinations of the excised gland, in reality probably have existed for a long time. It would seem that there are many instances in which eventual carcinoma arising in a minute adenoma is prevented by the commonly practiced surgical resections. EARL O. LATIMER, M.D.

Covarrubias, A.: Parathyroidectomy in the Treatment of Scleroderma (La paratiroidectomia en el tratamiento de la esclerodermia). *Acad. argent. cirug.*, 1943, 27: 958

In the last three years the author treated 15 patients with scleroderma, among them 13 women. The age of the patients ranged from twenty to forty years.

The hypothesis has been advanced that gonadal factors are capable of provoking the condition, but definite proof is lacking.

Three clinical forms of scleroderma may be distinguished: generalized, progressive, and circumscribed. Five of the author's patients showed the first form, 7 the second, and 3 the third.

In the progressive form, angiospastic phenomena in the digital arteries are preceded by induration of the skin which may last several years before vascular symptoms appear. The sclerosis begins always in the hands and gradually involves the entire upper extremities, spreading little by little to the trunk and lower extremities.

The generalized form is initiated by a cutaneous firm edema which is replaced by a cutaneous sclerosis.

A study of the vagosympathetic balance failed to reveal a predominance of one or the other nervous system. The basal metabolism was normal.

Among the various theories of origin of scleroderma, parathyroid insufficiency has the greatest appeal to the author. To test this hypothesis he studied the calcium-phosphorus metabolism in 12 patients and determined the calcium, phosphorus, and phosphatase content of the blood, as well as the calcium ions and also the calcium or phosphorus deficits in the urine. No appreciable humoral alterations of the calcium and phosphorus contents could be detected.

A chemical analysis of biopsies obtained from sclerodermic areas disclosed increased water contents, marked diminution of ash, and a considerable increase of calcium. Such biochemical changes in the skin represent a constant alteration found in scleroderma and it may be stated that they precede anatomic changes.

The author performed parathyroidectomy on 15 patients after preliminary ligation of the middle and inferior thyroid veins. Ligation of the superior thyroid arteries, advocated by some surgeons to facilitate the removal of the upper parathyroid glands, is not recommended by the author.

Paralysis of the vocal cords or signs of tetany did not develop in any patient. The histological examination showed that in 4 of 15 patients, or 31.3 per cent, pseudoparathyroidectomy had been performed. One patient succumbed to a pulmonary complication.

Early results of the operation were good or even spectacular; the cutaneous rigidity disappeared and simultaneously the skin assumed its normal hue and temperature. Symptoms of Raynaud's disease, constant in the progressive form of scleroderma, were attenuated. As to remote results, they were excellent in cases in which the operation had been performed in early stages of the disease, while in more advanced cases great improvement was seen.

It is interesting to note that the amelioration of symptoms was equally good in cases in which the parathyroid gland had been removed and in those in which apparently the gland had inadvertently been left in situ. Evidently some obscure mechanism is responsible for such improvement.

Biochemical studies after the operation showed a tendency of the skin to re-establish normal conditions as far as water, ash, and calcium contents were concerned.

Daily injections of Collip's parathormone for a period of one month provoked scleroderma in rats; this was accompanied by the characteristic histological and chemical changes.

In another series of experiments an extensive débridement of the thyroid region was performed because it is technically impossible to perform parathyroidectomy in rats. Injections of parathormone failed to produce scleroderma in this group of animals. The author concludes that the operation protected the animals from the effect of Collip's parathormone. JOSEPH K. NARAT, M.D.

Nellen, M.: Thymectomy for Myasthenia Gravis. *Brit. M. J.*, 1943, 2: 778.

Myasthenia gravis is often associated with a hypertrophied persistent cystic thymus. Eighteen cases of myasthenia gravis in the literature and treated by thymectomy, and an additional case treated by the author are reviewed.

The preoperative treatment required a definite medical regime. Operation should be delayed until the patient is clear of any infection, especially upper respiratory disease which causes an exacerbation of the symptoms of myasthenia gravis. The patient should receive enough sulfadiazine so that the sulfonamide level in the blood is between 5 and 6 mgm. per cent. Before the induction of anesthesia the patient should receive from 1.5 to 2.5 mgm. of prostigmin, 0.6 mgm. of atropine and a similar dose of morphine.

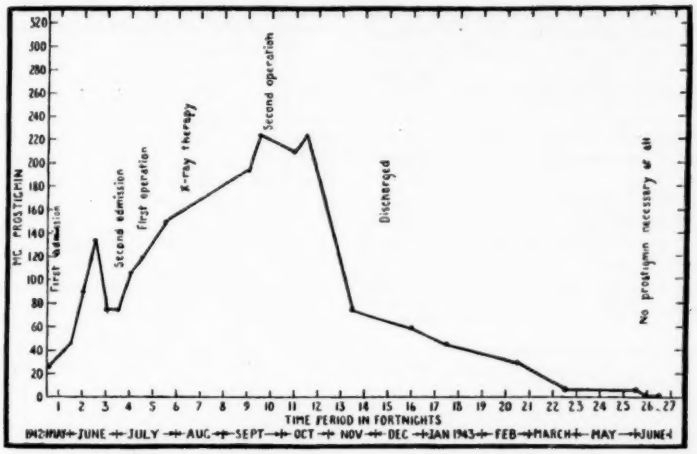


Fig. 1. Graph showing decreased need for prostigmin after thymectomy for myasthenia gravis.

The operation of thymectomy can be done in a single stage by the sternal-splitting method. For a period of about six weeks after operation the patient requires larger doses of prostigmin than he received preoperatively.

It is believed that the thymus is the source of the inhibitor agent circulating in the blood and is responsible for the functional myasthenia. The author believes that a thymectomy is warranted in every case of myasthenia gravis.

BENJAMIN G. P. SHAFIROFF, M.D.

EXPERIMENTAL SURGERY

Weiss, P., and Taylor, A. C.: Histomechanical Analysis of Nerve Reunion in the Rat after Tubular Splicing. *Arch. Surg.*, 1943, 47: 419.

The results of this study are based on experiments on 39 rat nerves, either peroneal or tibial, which were transected, reunited by means of an arterial sleeve, and then studied from one to fifteen days after the operation. The arterial sleeves were so chosen as to fit comfortably over the nerve ends without producing constriction. The ends of the nerve were not closely approximated but were left separated by a gap varying in extent from a fraction of, to several times the diameter of, the nerve, i.e., from about one-half millimeter to several millimeters. In some cases the gap became wider than was intended, because of the partial retraction of one or both nerve stumps from the sleeve. Excess blood was not blotted from the interior of the gap, but was left in place. This blood played an integral part in the healing process. As anesthesia, produced with pentobarbital, was maintained for several hours, the seal between the nerve ends had become sufficiently firm by the time the animals began to move about.

In order to investigate the phenomena taking place at the distal suture line of a graft in the absence of nerve fibers, splices between two peripheral nerve segments were effected. For this purpose, a piece several millimeters in length was excised from the proximal sciatic nerve. Two weeks were allowed for the degeneration of the peripheral stump. After this period, either the tibial or the peroneal nerve, or both, were transected and reunited by arterial sleeves. In this case, neither stump contained intact nerve fibers; such nerves are referred to as "aneuritic." Biopsy studies were made within two weeks after the operation, special attention being paid to the medium filling the sleeves between the nerve ends.

Immediately after the operation, the artery is attached to the nerve ends by clotted blood and lymph. The gap between the nerve ends is filled with a dark purple blood clot visible through the translucent walls of the artery. This filling and the moderate tension along the nerve keep the arterial tubes from collapsing. Within four or five days after the operation, the blood clot undergoes profound physical and chemical transformations. It is through these transformations that the severed texture of the nerve becomes rewoven in such a manner as to permit the unimpeded transit of sheath cells and regenerating axons from one stump to the other. Resolved into component steps, the reweaving occurs as follows:

Phase 1. Immediately after the operation, a firm connection between the nerve ends is established by the fibrin reticulum of the clotting blood in the gap, the fibrin threads inserting directly on the cut surfaces. The erythrocytes lie in clusters embedded in the fibrin meshes.

Phase 2. Within twenty-four hours, most of the erythrocytes disintegrate, while the fibrin framework

persists. Later, proteolysis along the inner wall of the artery breaks the connections between the clot and the sleeve. Thus, detached all around its circumference, while firmly cemented to the two nerve stumps, the cylindrical clot becomes subjected to longitudinal tension.

Phase 3. The fibrin net assumes preponderantly longitudinal orientation corresponding to the lines of tension.

Phase 4. By the third day, fibrinolytic liquefaction has set in within the clot. Its action is differential, in that it dissolves mostly the transverse threads of the fibrin meshes while it spares the longitudinal ones. Somehow, tension has rendered the longitudinally oriented fibrin fibers more resistant to proteolytic destruction.

Phase 5. By this time, migration of cells into the region of the former gap has begun. Sheath cells and nerve fibers move out along the solid strands of fibrin and are likewise oriented in the longitudinal direction of the nerve. Simultaneously, macrophages move in and continue to clear the spaces between the fibers.

Phase 6. By the fifth day, a continuous straight cell bridge, followed by regenerating axons, extends along the former gap. The Schwann cells of this bridge stimulate the deposition of collagen along their surfaces, and a system of collagen fibers, oriented longitudinally, is laid down as the endoneurium of the nerve segment.

Phase 7. When continuity between the nerve stumps is completely restored, channels are opened for the passage of endoneurial fluid, which may serve to keep the interior of the nerve in the required state of fluidity.

The interweaving of severed nerve stumps thus occurs essentially by three successive processes: (1) the formation of an oriented scaffolding of fibrin fibers; (2) an oriented migration of living cells and nerve fibers retracing and filling the fibrin matrix; and (3) collagenization, under the influence of these cells, of the intercellular spaces, in continuity with the stumps. By contrast, the scar forming between two nerve ends not protected by a sleeve fails to undergo longitudinal orientation, becomes invaded by all kinds of surrounding connective-tissue cells, and establishes a sort of foreign block in the continuity of the nerve. The two stumps, instead of being rewoven into an integral fabric over which sheath cells, nerve fibers, blood vessels, and capillary liquid may pass freely and easily, are merely patched up by what amounts to a mechanical cementing tissue of low permeability.

These experiments have established a number of conditions prerequisite for optimal nerve regeneration. They point the way toward the avoidance of confused suture lines, neuromas, gliomas, and nerve fibrosis. Even if the arterial splice as such should not be applicable in clinical practice, the lessons learned from this analysis of its merits may guide the search for improved methods of nerve repair.

SAMUEL KAHN, M.D.

Cleghorn, R. A.: The Effect of Different Environmental Temperatures on the Survival of Dogs after Severe Bleeding. *Canad. M. Ass. J.*, 1943, 49: 363.

In a preceding contribution the author described a method for producing shock in dogs by bleeding them from a cannulated femoral artery. A fairly close correlation was found between the blood-pressure level at the end of the bleeding period, expressed as a percentage of the blood pressure at the outset, and the survival of the dogs. In the present report a group of 68 dogs, bled to the point at which the outcome was doubtful, were placed in different experimentally controlled environmental temperatures. The mortality at four different temperatures was as follows: 18 per cent at 72°F., 38 per cent at 52°F., 45 per cent at 85°F., and 93 per cent at 95°F.

The mild degree of cooling (52°F.) was associated with a mortality amounting to twice that of the dogs kept at 72°F.; this is attributable to the heightened oxygen requirement resulting from the increased stimulus to heat production exerted by the cold. However, the withholding of water for a period of twenty-four hours following bleeding is less serious in animals kept in a cool atmosphere because of the lessened insensible water loss. In a group of 48 dogs in the four different environmental temperatures after bleeding, the insensible water loss (average no. of cc. per kgm.) was as follows: 0.9 at 52°F., 2.3 at 72°F., 2.0 at 85°F., and 4.0 at 95°F.

The mild warming exerted by an atmosphere of 85°F. resulted in a mortality of more than twice that of dogs in the 72°F. group. This probably represents the deleterious influence of vasodilatation, for the insensible water loss was not increased above that of the dogs kept at 72°F.

The more extreme degree of warming used, namely 95°F., was associated with a mortality of 93 per cent. The fact that the mortality was greater at 95°F. than at 85°F. is attributable to the diminution in the amount of fluid available for dilution of the blood in the tissues at the higher temperature. This is a direct result of the increase in the insensible water loss, associated with panting, at this temperature. This explanation was supported by the finding that the administration of water, in an amount equivalent to the increase in the insensible water loss, to a group of dogs exposed to 95°F., reduced the mortality to about that of dogs at 85°F.

The differences in the responses of dogs and man to elevation of the environment temperature are briefly discussed, and reasons are cited why patients suffering a critical reduction in blood volume, as in shock and hemorrhage, should not be heated.

ERNEST E. ARNHEIM, M.D.

Smith, L. W., and Livingston, A. E.: Chlorophyll. An Experimental Study of Its Water-Soluble Derivatives in Wound Healing. *Am. J. Surg.*, 1943, 62: 358.

The effect of water-soluble chlorophyll preparations on the healing of experimentally standardized

TABLE I.—SUMMARY OF ALL EXPERIMENTS

Test Agent	Total Lesions Tested	Accelerated		Unaffected		Delayed	
		No.	Per cent	No.	Per cent	No.	Per cent
Chlorophyll preparations	448	304	67.9	120	26.7	24	5.4
Vitamin ointments	228	40	17.5	162	71.0	26	11.5
Sulfa compounds	304	31	10.1	144	47.4	129	42.5
Bio-dyne ointment	88	26	29.5	55	62.5	7	8.0
Methionine ointment	76	26	34.2	43	56.5	7	9.3
Castilian Malva infusion	76	27	35.5	43	56.5	6	8.0
Scharlach R ointment	76	23	30.2	43	56.5	10	13.3
Tetrodine powder	76	15	19.7	44	57.9	17	22.4
Totals	1,372	492	35.8	654	47.6	226	16.6

wounds was studied in guinea pigs, rats, rabbits, and dogs. The chlorophyll preparations tested were:

1. Chlorophyll in 0.2 per cent alkaline saline solution
2. Chlorophyll in 0.2 per cent buffered solution
3. Chlorophyll in lanoline-base ointment, 0.5–3 per cent
4. Chlorophyll in petrolatum-cholesterol ointment
5. Chlorophyll in hydrophilic base jelly, 1 per cent.

Twelve other preparations, such as vitamin ointments, methionine ointment, biodyne ointment, and sulfone compounds, served as test controls in addition to the usual untreated controls.

It was found that 67 per cent of the wounds treated with the chlorophyll preparations healed more quickly than any of the controls. This percentage was double the best percentage obtained with any of the other preparations. Of all the chlorophyll preparations, the hydrophilic jelly was most effective in 83 per cent of the wounds. There was an average decrease of three and one-half days, or 25 per cent of the normal healing time, when chlorophyll preparations were used. In some cases the reduction in healing time was as much as from six to eight days. Parallel results were obtained with infected wounds and standardized burns. The healing qualities of the chlorophyll preparations were ascribed to its growth-stimulating properties and bacteriostasis.

BENJAMIN G. P. SHAFIROFF, M.D.

Selbie, F. R., and McIntosh, J.: The Action of Chemotherapeutic Drugs (Including Proflavine) and Excipients on Healthy Tissue. *J. Path. Bact.*, Lond., 1943, 55: 477.

In this study a uniform technique was designed to avoid all reactions other than those arising from the toxicity of the substances to be tested. A known quantity of the substance was dissolved or suspended in water and 0.1 or 0.2 cc. was injected into the thigh muscles of mice. The mice were killed after three days, as it was found that the lesions were fully developed by that time. Any visible reactions were noted and the injected muscles were examined histologically.

Of the chemotherapeutic substances tested, the least toxic were the sulfonamides and penicillin; next in order of toxicity were the acridine salts, while propamidine and some of the acridine bases were definitely more toxic. The experiments showed that from the point of view of toxicity there is no reason that proflavine sulfate should not be used either as a solution or as a diluted powder on fresh wounds.

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Meakins, J. C.: The "Pulhems" System of Medical Grading. *Canad. M. Ass. J.*, 1943, 49: 349.

The present-day army is a highly specialized organization and wars today are won by skill, endurance, and intelligence rather than brute force. Every attribute of every soldier must be used to the greatest advantage. Therefore, the soldier must be carefully scrutinized and allocated to the job he can most likely do best. As the army is a new enterprise to most, the requirements for each assignment must be laid down with meticulous exactness and then men must be chosen with these requirements to fill the positions in the best manner. The functions of the officers of Personnel Selection cannot be carried out efficiently unless they receive from the Medical Corps a true physical, mental, and emotional picture of the raw product which the army must weld into an efficient warrior.

It is the duty of the Medical Corps to give an honest and specific anatomical description of each recruit, and his probable capacity as a prospective soldier. In addition to a listing of the anatomical defects of each recruit there should be a functional estimate of his physical capacity, and also of his intellectual status and emotional stability to accomplish the more or less intricate requirements of his job, and to withstand the spiritual strains of present-day warfare. This article, by the Deputy Director General of Medical Services of the Canadian Army, outlines a system of medical functional grading under seven headings.

The various functional requirements are listed as follows: physique (P), arms and shoulder girdle (U), locomotion (L), hearing (H), eyesight (E), mental status (M), and emotional stability (S). The soldier is graded in each of these functional requirements from 1 (perfect) to 5 (of no value to the Army), and in this way the physical standards for all of these functions can be outlined in a profile (Pulhems). These profiles are then utilized by the officers of Personnel Selection for allocation of duty. The grading of functional requirements is particularly useful in a modern army which is so highly mechanized, and physical defects with little functional disability allow satisfactory performance of many duties in the army.

The author emphasizes the importance of mental status (M) and emotional stability (S). Physical

defects account for 45 per cent of rejections, miscellaneous defects 10 per cent, and psychiatric, nervous, and mental defects practically equal the physical. This is substantiated by the fact that 40 per cent of discharges of soldiers in training on medical grounds are due to neuropsychiatric conditions and 35 per cent of battle casualties are due to the same causes.

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MEDICAL JURISPRUDENCE

Smith, H. W., and Cobb, S.: The Relation of Emotions to Injury and Disease: A Call for Forensic Psychosomatic Medicine. *Ann. Int. M.*, 1943, 19: 873.

A study of court decisions in regard to nervous shock reveals the absence in times past of any adequate criterion for judging actual causation of the alleged injury or disease by the given stimulus. Fright is the chief stimulus which underlies the nervous shock cases and the main disabilities claimed are "nervous shock" with resulting disability that is usually temporary; traumatic neuroses; and alleged psychic abortions or miscarriages.

The authors describe the current concept of "nervous shock" and the general mechanism of its production, and mention the independent diseases, aside from the various neuroses and immediate injuries, in which psychic stimulation may, according to present evidence, be a causal factor in the pathogenesis.

Need is stressed for continued and systematic study of the relations of all disease states and syndromes to the effect that psychic stimuli, particularly of acute character, may have either on the production of the condition or upon its activation, aggravation, or acceleration. The excessively vulnerable person should, for reasons of social policy, receive no more legal protection against mere negligence of an inadvertent actor than the person of average constitution. For this reason and because emotional stimuli may be mere trigger mechanisms, the most careful apportionment of final injury between accident and the pre-existing impairment or disease of the subject is necessary.

The authors attempt to provide a rationale for study of the existence and extent of liability in nervous shock cases and stress the need of keeping in mind the essential terms, Duty ± Dereliction ± Proximate Causation—Injury, the concurrent existence of which must be proved by a preponderance of substantial evidence before a plaintiff can establish any right of action. The term "physical impact" in the sense of striking the person of the plaintiff with a "physical object" has become meaningless with the advance of scientific knowledge and, by the same token, the distinction between "organic" and "functional" disorders has been eliminated. The authors conclude that disorder in function of an organ cannot occur without structural changes in that organ, although these may be temporary. Special attention is called to the need for studying the stimulus and its adequacy to produce a response in a person of average constitution, since this consideration must be taken into account in determining to what extent the response of the particular patient is due to his idiosyncracy, excessive vulnerability, or pre-existing impairment.

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